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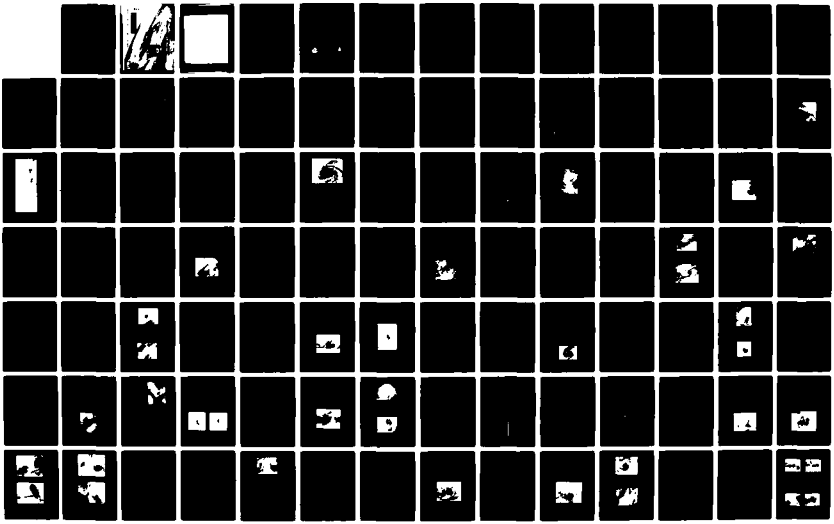
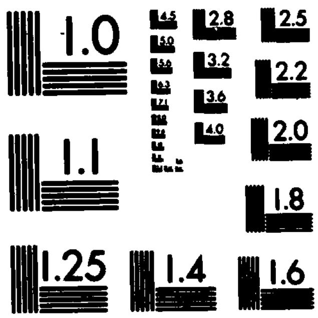
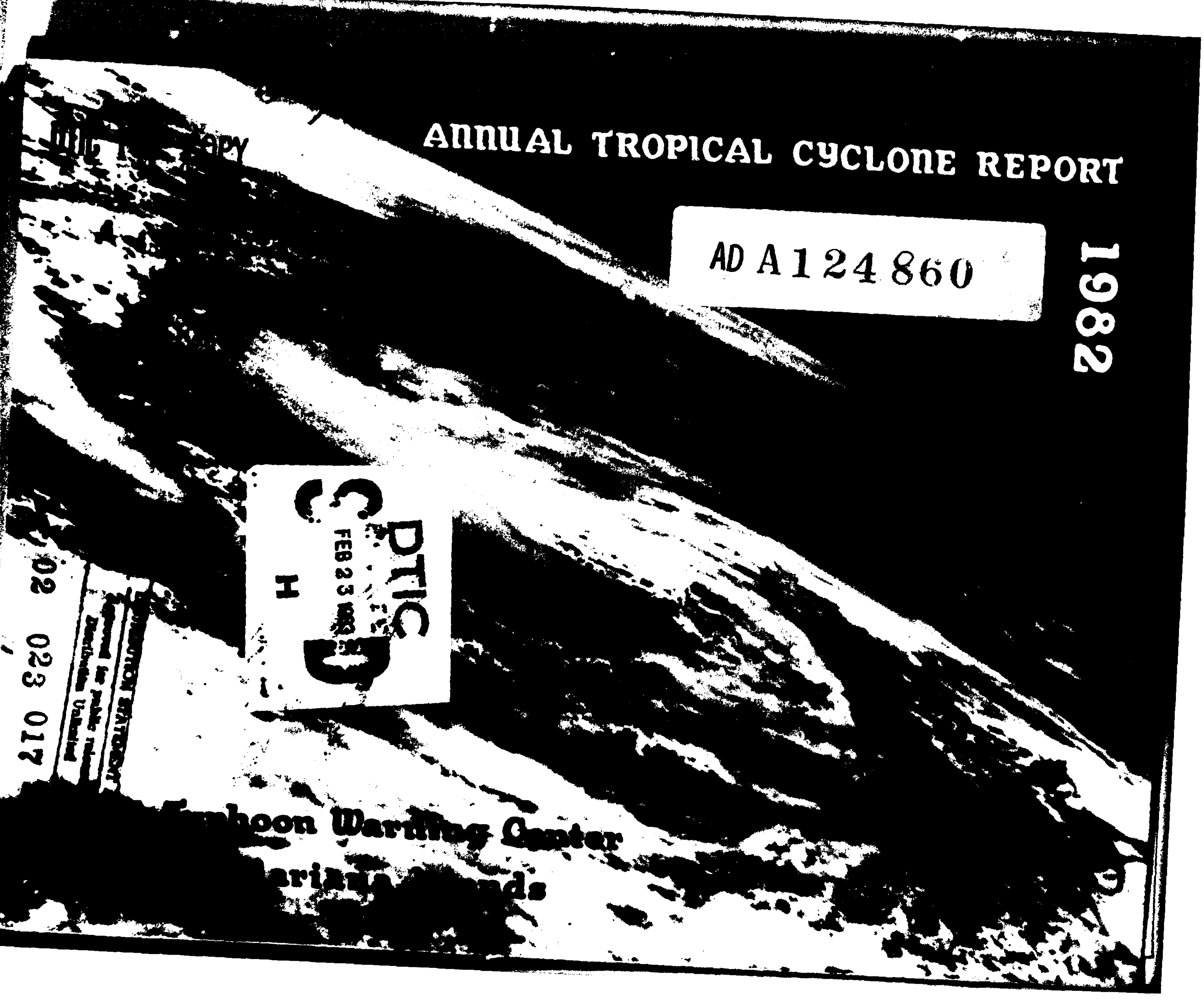




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A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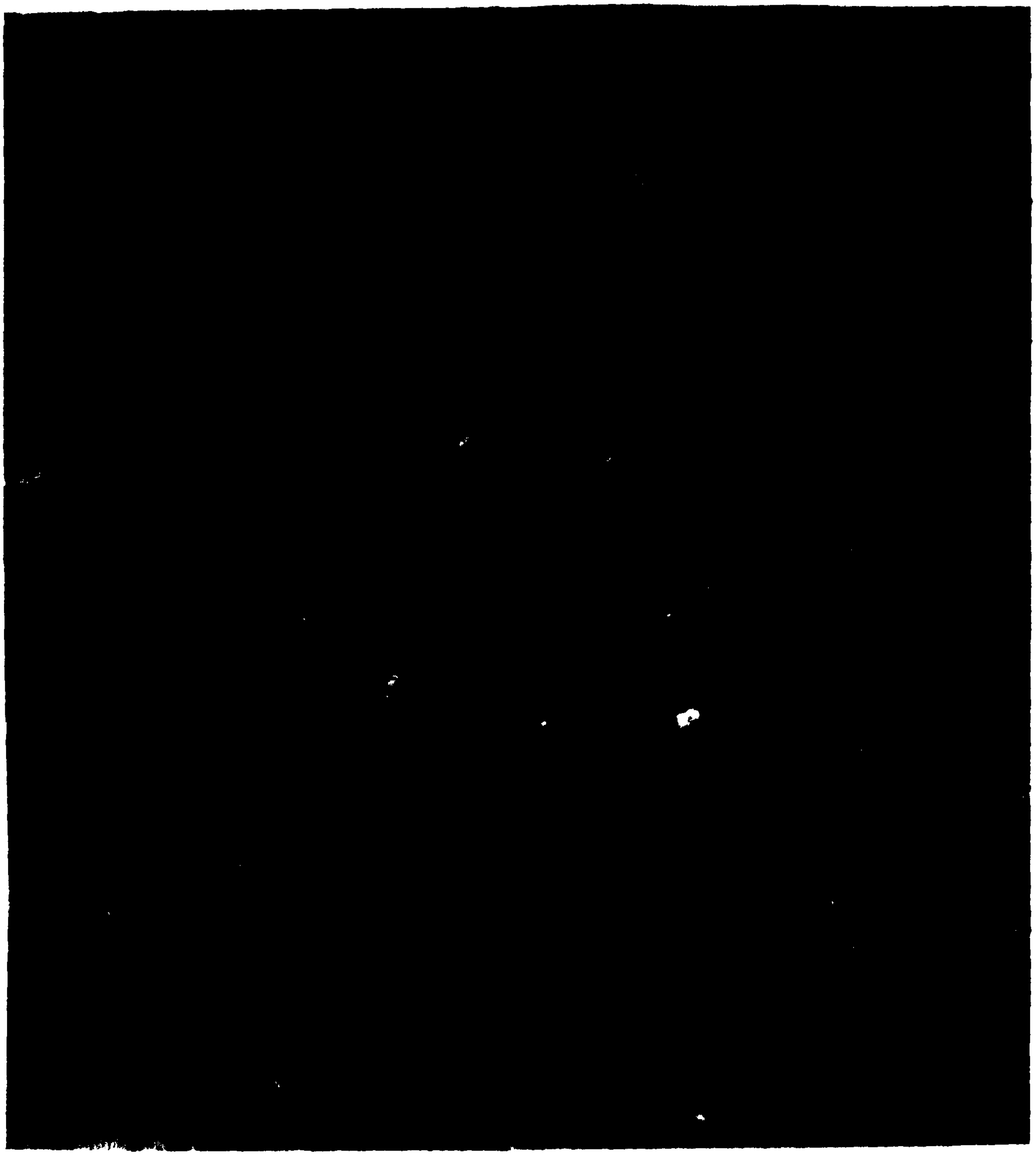

1982 ANNUAL TROPICAL CYCLONE REPORT "ERRATA"

1. Substitute the following table for TABLE 2-4, on page 8.

TABLE 2-4. FIX PLATFORM SUMMARY FOR 1982

FIX PLATFORM SUMMARY

WESTERN NORTH PACIFIC	AIRCRAFT	SATELLITE	RADAR	SYNOPTIC	TOTAL
TS MAMIE	7	68	3	--	78
TY NELSON	25	105	11	--	141
TY ODESSA	15	55	--	--	70
TY PAT	16	52	6	1	75
TY RUBY	15	63	--	--	78
TS TESS	--	40	--	8	48
TS SKIP	5	24	--	1	30
TS VAL	2	14	--	4	20
TS WINONA	11	72	14	--	97
TY ANDY	16	82	38	7	143
STY BESS	30	101	4	4	139
TY CECIL	16	86	92	3	197
TY DOT	23	66	3	2	94
TY ELLIS	24	87	64	3	178
TY FAYE	27	133	41	3	204
TY GORDON	36	90	--	--	126
TS HOPE	1	26	2	4	33
TY IRVING	13	109	59	7	188
TY JUDY	26	68	10	5	109
TY KEN	33	84	32	3	152
TS LOLA	--	28	--	--	28
TD 22	2	10	--	--	12
STY MAC	32	73	35	--	140
TY NANCY	19	80	14	2	115
TD 25	1	15	--	--	16
TY OWEN	27	128	--	--	155
TY PAMELA	44	160	22	3	229
TY ROGER	3	44	25	3	75
TOTAL	469	1963	475	63	2970
% OF TOTAL NR OF FIXES	15.8	66.1	16.0	2.1	100.0

INDIAN OCEAN	SATELLITE	SYNOPTIC	TOTAL
TC 20-82	46	--	46
TC 22-82	31	--	31
TC 23-82	29	--	29
TC 24-82	6	1	7
TC 25-82	10	4	14
TOTAL	122	5	127
% OF TOTAL NR OF FIXES	96.1	3.9	100.0

2. Page 140, TABLE 4-4. 24-hour posit error for ALL FORECASTS is missing, insert "138".

U.S. NAVAL OCEANOGRAPHY COMMAND CENTER
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FOREWORD

The Annual Tropical Cyclone Report is prepared by the staff of the Joint Typhoon Warning Center (JTWC), a combined USAF/USN organization operating under the command of the Commanding Officer, U.S. Naval Oceanography Command Center/Joint Typhoon Warning Center, Guam. JTWC was established in April 1959 when CINCPAC directed CINCPACFLT to provide a single tropical cyclone warning center for the western North Pacific region. The operations of JTWC are guided by CINCPACINST 3140.1 (series).

The mission of the Joint Typhoon Warning Center is multi-faceted and includes:

1. Continuous meteorological monitoring of all tropical activity in the Northern and Southern Hemispheres, from 180 degrees longitude westward to the east coast of Africa, to anticipate tropical cyclone development.

2. Issuing warnings for all significant tropical cyclones in the above area of responsibility.

3. Determination or reconnaissance requirements for tropical cyclone surveillance and assignment of appropriate priorities.

4. In depth post-storm analysis of all tropical cyclones occurring within the western North Pacific and North Indian Oceans for publication in this report.

5. Cooperation with the Naval Environmental Prediction Research Facility (NEPRF), Monterey, California, on the operation evaluation of tropical cyclone models and forecast aids, and the development of new techniques to support operational forecast scenarios.

Should JTWC become incapacitated, the Alternate JTWC (AJTWC), located at the U.S. Naval Western Oceanography Center, Pearl Harbor, Hawaii, assumes warning responsibilities. Assistance in determining satellite reconnaissance requirements, and in obtaining the resultant data, is provided by Detachment 4, 1WW, Hickman AFB, Hawaii.

Satellite imagery used throughout this report represents data obtained by the tropical cyclone satellite surveillance network. The personnel of Det 1, 1WW, colocated with JTWC at Nimitz Hill, Guam, coordinate the satellite acquisitions and tropical cyclone surveillance by the following units:

Det 5, 1WW, Clark AB, RP
Det 8, 1WW, Kadena AB, Japan
Det 15, 30WS, Osan AB, Korea
Det 4, 1WW, Hickam AFB, Hawaii
Air Force Global Weather Center, Offutt AFB, Nebraska

In addition, the Naval Oceanography Command Detachment, Diego Garcia, and DMSP equipped U.S. Navy aircraft carriers have been instrumental in providing vital satellite position fixes of tropical disturbances in the Indian Ocean.

In line with the proposals to implement metric units of measurements within the United States over the next few years, various civilian and military organizations have begun extensive educational programs through use of metric equivalents in their publications. This report will include metric unit equivalent measures whenever possible.

A special thanks is extended to the men and women of: 27th Communication Squadron, Operating Location C, for their continuing support by providing high quality, real-time satellite imagery; the Pacific Fleet Audio-Visual Center, Guam, for their assistance in the reproduction of satellite and graphics data for this report; to the Navy Publications and Printing Service Branch Office, Guam, for their efforts to meet publication deadlines; and to Mrs. Cynthia Blevins for her patience and perseverance in typing the many drafts and the final manuscript of the report.

NOTE: Appendix 5 contains information on how to obtain past issues of the <u>Annual Typhoon Report</u> (redesignated <u>Annual Tropical Cyclone Report</u> in 1980).

TABLE OF CONTENTS

CHAPTER I - OPERATIONAL PROCEDURES

1. GENERAL

The Joint Typhoon Warning Center (JTWC) provides a variety of routine services to the organizations within its area of responsibility, including:

a. Significant Tropical Weather Advisories: issued daily, this product describes all tropical disturbances and assesses their potential for further development;

b. Tropical Cyclone Formation Alerts: issued when synoptic, satellite and/or aircraft reconnaissance data indicate development of a significant tropical cyclone in a specified area is likely;

c. Tropical Cyclone Warnings: issued periodically throughout each day for significant tropical cyclones, giving forecasts of position and intensity of the system; and

d. Prognostic Reasoning Message: issued twice daily for tropical storms and typhoons in the western North Pacific; these messages discuss the rationale behind the most recent warnings.

The recipients of the services of JTWC essentially determine the content of JTWC's products according to their ever-changing requirements. Thus, the spectrum of the routine services is subject to change from year to year; such changes are usually the result of deliberations held at the Annual Tropical Cyclone Conference.

2. DATA SOURCES

a. COMPUTER PRODUCTS:

A standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Oceanography Center (FNOC) at Monterey, California. These products are provided via the Naval Environmental Data Network (NEDN).

b. CONVENTIONAL DATA:

This data set is comprised of land-based and shipboard surface and upper-air observations taken at or near synoptic times, cloud-motion winds derived twice daily from satellite data, and enroute meteorological observations from commercial and military aircraft (AIREPS) within six hours of synoptic times. Conventional data charts are prepared daily at 0000Z and 1200Z using hand- and computer-plotted data for the surface/gradient, 500 mb (mid-tropospheric), and 200 mb (upper-tropospheric) levels. In addition to these charts, a 700 mb (lower-tropospheric) chart is computer-plotted from rawinsonde/pibal observations received at FNOC for the 12-hour synoptic times.

c. AIRCRAFT RECONNAISSANCE:

Aircraft weather reconnaissance data are invaluable for the position of the center of developing systems and essential for the accurate determination of numerous parameters, including;

- eye/center temperature and dewpoint
- maximum surface and flight level wind
- minimum sea level pressure
- horizontal wind distribution

In addition, wind and pressure-height data at the 500 and/or 400 mb level, provided by the aircraft while enroute to, or from fix missions, provide a valuable supplement to the all too sparse data fields of JTWC's area of responsiblity. A comprehensive discussion of aircraft weather reconnaissance is presented in Chapter II.

d. SATELLITE RECONNAISSANCE:

Meteorological satellite data obtained from Defense Meteorological Satellite Program (DMSP), and National Oceanic and Atmospheric Administration (NOAA), spacecraft played a major role in the early detection and tracking of tropical cyclones in 1982. A discussion of the role of these programs is presented in Chapter II.

e. RADAR RECONNAISSANCE:

During 1982, as in previous years, land radar coverage was utilized extensively when available. Once a tropical cyclone moved within the range of land radar sites, their reports were essential for determination of small scale movement. Use of radar reports during 1982 is discussed in Chapter II.

3. COMMUNICATIONS

a. JTWC currently has access to three primary communications circuits.

(1) The Automated Digital Network (AUTODIN) is used for dissemination of warnings and other related bulletins to Department of Defense installations. These messages are relayed for further transmission over U.S. Navy Fleet Broadcasts, and U.S. Coast Guard CW (continuous wave Morse code) and voice broadcasts. Inbound message traffic for JTWC is received via AUTODIN addressed to NAVOCEANCOMCEN GUAM or JTWC GUAM.

(2) The Air Force Automated Weather Network (AWN) provides weather data to JTWC through a dedicated circuit from the Automated Digital Weather Switch (ADWS) at Hickam AFB, Hawaii. The ADWS selects and routes the large volume of meteorological reports necessary to satisfy JTWC requirements for the right data at the right time. Weather bulletins prepared by JTWC are inserted into the AWN circuit via the NEDS and the Nimitz Hill Naval Telecommunication Center (NTCC) of the Naval Communications Area Master Station Western Pacific.

(3) The Naval Environmental Data Network (NEDN) is the communications link with the computers at FNOC. JTWC is able to receive environmental data from FNOC and access the computers directly to run various programs.

b. The Naval Environmental Display Station (NEDS) has become the backbone of the JTWC communications system; it is the terminal that provides a direct interface with the NEDN and AWN; and it is capable of preparing messages for indirect AUTODIN transmission. The NEDS also provides a means for the Typhoon Duty Officer (TDO) to request forecast aids which are processed on the FNOC computers and transmitted to the TDO over the NEDN circuit.

4. ANALYSES

A composite surface/gradient level (3000 ft (915 m)) manual analysis of the JTWC area of responsibility is accomplished on the 0000Z and 1200Z conventional data. Analysis of the wind field using streamlines is stressed for tropical and subtropical regions. Analysis of the pressure field is accomplished routinely by the Naval Oceanography Command Center (NOCC) Operations watch-team and may be used in conjunction with JTWC's analysis of tropical wind fields.

Manual streamline analysis of the 500 mb level is accomplished on the 0000Z and 1200Z data. This analysis is used to delineate the mid-tropospheric steering currents, which can be extremely important to the tropical cyclone forecast.

A composite upper-tropospheric manual streamline analysis is accomplished daily utilizing rawinsonde data from 300 mb through 100 mb, winds derived from cloud motion analysis, and AIREPS (plus or minus 6 hours) at or above 29,000 feet (8,839 m). Wind and height data are used to arrive at a representative analysis of tropical cyclone outflow patterns, mid-latitude steering currents, and features that may influence tropical cyclone intensity. All charts are hand-plotted over areas of tropical cyclone activity to provide all available data as soon as possible to the TDO. These charts are augmented by the computer-plotted charts for the final analysis.

A 700 mb computer-plotted chart is available for streamline or height-change analysis from the 0000Z and 1200Z data base. Additional sectional charts at intermediate synoptic times and auxiliary charts such as station-time plot diagrams and pressure-change charts are also analyzed during periods of significant tropical cyclone activity.

5. FORECAST AIDS

The following objective techniques were employed in tropical cyclone forecasting during 1982 (a description of these techniques is presented in Chapter IV):

a. MOVEMENT

(1) 12-HR EXTRAPOLATION

(2) CLIMATOLOGY

(3) HPAC (Extrapolation/Climatology)

(4) BPAC (Extrapolation/Climatology)

(5) CYCLOPS (Steering)

(6) TYAN78 (Analog)

(7) ONE-WAY TROPICAL CYCLONE MODEL (Dynamic)

(8) NESTED TROPICAL CYCLONE MODEL (Dynamic)

(9) TAPT (Empirical)

b. INTENSITY

(1) THETA E (Empirical)

(2) WIND RADIUS (Analytical)

(3) DVORAK (Empirical)

6. FORECAST PROCEDURES

a. INITIAL POSITIONING:

In the preparation of each warning an accurate location (fix) of the tropical cyclone's surface center within two to three hours of warning time is of prime importance. JTWC uses the Selective Reconnaissance Program (SRP) to levy an optimal mix of available resources to obtain the necessary fix information. Whenever a tropical cyclone is poorly defined or the actual surface center cannot be determined, and when conflicting fix information is received, the "best estimate" of the surface location is subjectively determined from the analysis of all available data. If the fix data are not available due to reconnaissance platform malfunctions or communication problems, synoptic data or extrapolation from previous fixes are used. The warning position is then obtained by determining the "best track" of the tropical cyclone up to the last fix, or best estimate of the position of its surface center, and forecasting its movement to the warning time.

b. TRACK FORECASTING:

A preliminary forecast track is developed based on an evaluation of the rationale behind the previous warning and the guidance given by the most recent objective techniques and numerical prognoses. This preliminary track is subjectively modified based on the following considerations:

(1) The prospects for recurvature or erratic movement are evaluated. This evaluation is based primarily on the present and forecast, positions and amplitudes of the middle-tropospheric, mid-latitude troughs as depicted on the latest upper air analyses and numerical prognoses.

(2) Determination of the best steering level is partly influenced by the maturity and vertical extent of the tropical cyclone. For mature tropical cyclones located south of the subtropical ridge, forecast changes in speed of movement are closely correlated with anticipated changes in the intensity or relative position of the ridge. When steering currents are relatively weak, the tendency for tropical cyclones to move northward due to internal forces is an important consideration.

(3) Over the 12- to 72-hour forecast period, speed of movement during the early forecast period is usually biased toward persistence, while the subsequent forecast periods are biased toward objective

techniques. When a tropical cyclone moves poleward, and toward the mid-latitude steering currents, speed of movement becomes increasingly more biased toward a selective group of objective techniques capable of estimating significant increases in speed of movement.

(4) The proximity of the tropical cyclone to other tropical cyclones is closely evaluated to determine if there is a possibility of a Fujiwhara interaction (the apparent rotation of two or more cyclones about a common axis or axes).

A final check is made against climatology to determine whether the forecast track is reasonable. If the forecast deviates greatly from one of the climatological tracks, the forecast rationale may be reappraised.

c. INTENSITY FORECASTING:

In this parameter, heavy reliance is placed on intensity trends from aircraft reconnaissance reports, wind and pressure data from ships and land stations in the vicinity of the tropical cyclone, the Dvorak satellite interpretation model and other objective techniques. An evaluation of the entire synoptic situation is made, including the location of major troughs and ridges, the position and intensity of any nearby tropical upper-tropospheric troughs (TUTT), the vertical and horizontal extent of the tropical cyclone's circulation and the extent of the associated upper-level outflow pattern. An essential element affecting each intensity forecast is the accompanying forecast track and the influence of environmental parameters along that track, such as: sea thermal fronts, terrain influences, vertical wind shear, and an extratropical environment.

Once the forecast intensities have been derived, the horizontal distribution of destructive winds (greater than 30-, 50- and 100-knots) is determined. The most recent wind radii and associated asymmetries are deduced from all available surface wind observations and reconnaissance aircraft reports. Based on the current wind distribution, preliminary estimates of future wind radii are provided by an empirically derived objective technique. These estimates may be subjectively modified based on the anticipated interaction of the tropical cyclone's circulation with forecast locations of large-scale wind regimes and significant landmasses. Other factors including the tropical cyclone's speed of movement and possible extratropical transition are considered.

7. WARNINGS

Tropical cyclone warnings are issued when a definite closed circulation is evident and maximum sustained surface winds are forecast to increase to 34 knots (18 meters per second) within 48 hours, or if the tropical cyclone is in such a position that life or property may be endangered within 72 hours. Warnings may also be issued in other situations if it is determined that there is a need to alert military or civil interests to conditions which may become hazardous in a short period of time.

Each tropical cyclone warning is numbered sequentially and includes the following information: the position of the surface center; estimate of the position accuracy and the supporting reconnaissance (fix) platforms; the direction and speed of movement in the past six hours; the intensity and radial extent of surface winds over 30-, 50-, and 100-knots, when applicable. At forecast intervals of 12-, 24-, 48- and 72-hours, information on the tropical cyclone's anticipated position, intensity and wind radii is also provided.

Warnings within the western North Pacific Ocean are issued within two hours of 0000Z, 0600Z, 1200Z and 1800Z with the constraint that consecutive warnings may not be more than seven hours apart. Warnings in the North Indian Ocean are issued within two hours of 0200Z, 0800Z, 1400Z and 2000Z, again with the constraint that consecutive warnings may not be more than seven hours apart. Warning forecast positions are verified against the corresponding "best track" positions. A summary of the verification results from 1982 is presented in Chapter IV.

As of 1 January 1980, JTWC issues tropical cyclone warnings in an Automated Data Processing (ADP) format. This formatted warning possesses readability for all users and allows activities with ADP equipment to enter tropical cyclone warning data directly into ADP equipment data bases.

8. PROGNOSTIC REASONING MESSAGE

For tropical storms and typhoons in the western North Pacific Ocean, prognostic reasoning messages are transmitted following the 0000Z and 1200Z warnings, or whenever the previous reasoning is no longer valid. This plain language message is intended to provide meteorologists with the reasoning behind the latest JTWC forecast.

Included in the prognostic reasoning message are confidence statements for the 24- and 48-hour forecast positions. These confidence values are percentage probabilities that forecast position errors will be less than 100 and 150 nm, and 200 and 300 nm for 24 and 48 hours, respectively. These probabilities are based on objective data from error analysis studies of past tropical cyclones and are a function of current position, initial forecast movement, intensity, and the number of tropical cyclones in warning status in the western North Pacific Ocean.

In addition to this message, prognostic reasoning information applicable to all customers is provided in the remarks section of warnings when significant forecast changes are made or when deemed appropriate by the TDO.

9. SIGNIFICANT TROPICAL WEATHER ADVISORY

This product contains a general, non-technical description of all tropical disturbances in the JTWC area of responsibility and an assessment of their potential for further (tropical cyclone) development. In addition, all tropical cyclones in warning status are briefly discussed. This message is issued by 0600Z daily and is reissued whenever the situation warrants.

10. TROPICAL CYCLONE FORMATION ALERT

Formation alerts are issued whenever interpretation of satellite imagery and other meteorological data indicates that the formation of a significant tropical cyclone is likely. These formation alerts will specify a valid period not to exceed 24 hours and must either be cancelled, reissued, or superseded by a tropical cyclone warning prior to the expiration of the valid time.

CHAPTER II - RECONNAISSANCE AND FIXES

1. GENERAL

The Joint Typhoon Warning Center depends on reconnaissance to provide necessary, accurate, and timely meteorological information in support of each warning. JTWC relies primarily on three reconnaissance platforms: aircraft, satellite, and radar. In data rich areas synoptic data are also used to supplement the above. Optimum utilization of all available reconnaissance resources is obtained through the Selective Reconnaissance Program (SRP); various factors are considered in selecting a specific reconnaissance platform including capabilities and limitations, and the tropical cyclone's threat to life/property afloat and ashore. A summary of reconnaissance fixes received during 1982 is included in Section 6 of this Chapter.

2. RECONNAISSANCE AVAILABILITY

a. Aircraft

Aircraft weather reconnaissance in the JTWC area of responsibility is performed by the 54th Weather Reconnaissance Squadron (54th WRS) located at Andersen Air Force Base, Guam. The 54th WRS is presently equipped with six WC-130 aircraft and, from July through October, is augmented by the 53rd WRS from Keesler Air Force Base, Mississippi, bringing the total number of available aircraft to nine. The JTWC reconnaissance requirements, provided daily throughout the year to the Tropical Cyclone Aircraft Reconnaissance Coordinator (TCARC), include system(s) to be fixed, fix times, and forecast positions for each fix. The following priorities are utilized in acquiring meteorological data from reconnaissance aircraft in the western North Pacific area in accordance with CINCPACINST 3140.1 (series):

(1) Investigative flights and vortex or center fixes.

(2) Synoptic data acquisition in support of tropical cyclone warnings.

(3) Supplementary fixes on tropical cyclones.

As in previous years, aircraft reconnaissance provided direct measurements of height, temperature, flight-level winds, sea level pressure, estimated surface wind (when observable), and numerous additional parameters. The meteorological data are gathered by the Aerial Reconnaissance Weather Officers (ARWO) and dropsonde operators of Detachment 4, Hq AWS, who fly with the 54th WRS. These data provide the Typhoon Duty Officer (TDO) with indications of changing tropical cyclone characteristics, radii of associated winds, and current tropical cyclone position and intensity. Another important aspect is the availability of the data for research on tropical cyclone analysis and forecasting.

b. Satellite

Satellite fixes from USAF/USN ground sites and USN ships provide day and night coverage in the JTWC area of responsibility. Interpretation of this satellite imagery provides tropical cyclone positions and estimates of current and forecast intensities through the Dvorak technique (for daytime passes).

c. Radar

Land radar provides positioning data on well developed tropical cyclones when in the proximity (usually within 175 nm (324 km)) of the radar sites in the Philippines, Taiwan, Hong Kong, Japan, South Korea, Kwajalein, and Guam.

d. Synoptic

In 1982 JTWC also determined tropical cyclone positions based on the analysis of the surface/gradient level synoptic data. These positions were helpful in situations where the vertical structure of the tropical cyclone was weak or accurate surface positions from aircraft were not available due to flight restrictions.

3. AIRCRAFT RECONNAISSANCE SUMMARY

During the 1982 tropical season, the JTWC levied 276 vortex fixes and 50 investigative missions of which 17 were flown into disturbances which did not develop. In addition to the levied fixes, 180 supplemental fixes were also obtained. The average vector error for all aircraft fixes received at the JTWC during 1982 was 11 nm (20 km).

Aircraft reconnaissance effectiveness is summarized in Table 2-1 using the criteria as set forth in CINCPACINST 3140.1 (series).

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

EFFECTIVENESS	NUMBER OF LEVIED FIXES	PERCENT
COMPLETED ON TIME	239	86.5
EARLY	6	2.2
LATE	14	5.1
MISSED	17	6.2
TOTAL	276	100.0

LEVIED VS. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965-1970	507	10	2.0
1971	802	61	7.6
1972	624	126	20.2
1973	227	13	5.7
1974	358	30	8.4
1975	217	7	3.2
1976	317	11	3.5
1977	203	3	1.5
1978	290	2	0.7
1979	289	14	4.8
1980	213	4	1.9
1981	201	3	1.5
1982	276	17	6.2

4. SATELLITE RECONNAISSANCE SUMMARY

The Air Force provides satellite reconnaissance support to JTWC using imagery from a variety of spacecraft. The tropical cyclone satellite surveillance network consists of both tactical and centralized facilities. Tactical DMSP sites are located at Nimitz Hill, Guam; Clark AB, Republic of the Philippines; Kadena AB, Japan; Osan AB, Korea; and Hickam AFB, Hawaii. These sites provide a combined coverage that includes most of the JTWC area of responsibility in the western North Pacific from near the dateline westward to the Malay Peninsula. The Naval Oceanography Command Detachment, Diego Garcia, provides NOAA polar-orbiting coverage in the central South Indian Ocean; this reconnaissance supplements the Air Force Global Weather Central (AFGWC) support in this data sparse region.

AFGWC, located at Offutt AFB, Nebraska, is the centralized member of the tropical cyclone satellite surveillance network. In support to JTWC, AFGWC processes imagery from DMSP and NOAA spacecraft. Imagery processed at AFGWC is recorded on-board the spacecraft as it passes over the earth. Later, these data are downlinked to AFGWC via a network of command/readout sites and communications satellites. This enables AFGWC to obtain the coverage necessary to fix all tropical systems of interest to JTWC. AFGWC has the primary responsibility to provide tropical cyclone surveillance over the entire Indian Ocean and portions of the western North Pacific on both sides of the dateline. Additionally, AFGWC can be tasked to provide tropical cyclone positions in the western North Pacific and South Pacific as backup to coverage routinely available in those regions.

The hub of the network is Det 1, 1WW, colocated with JTWC on Nimitz Hill, Guam. Based on available satellite coverage, Det 1 coordinates satellite reconnaissance requirements with JTWC and tasks the individual network sites for the necessary tropical cyclone fixes. Therefore, when a position from a polar-orbiting satellite is required as the basis for a warning, called a "levied fix", a dual-site tasking concept is applied. Under this concept, two sites are tasked to fix the tropical cyclone from the same satellite pass. This provides the necessary redundancy to virtually guarantee JTWC a successful satellite fix on the tropical cyclone. Using this dual-site concept, the satellite reconnaissance network is capable of meeting all of JTWC's levied satellite fix requirements. Dual-site tasking can also be applied in portions of the North Indian Ocean by tasking AFGWC and the Navy site at Diego Garcia.

The network provides JTWC with several products and services. The main service is one of surveillance. Each site reviews its daily satellite coverage for indications of tropical cyclone development. If an area exhibits the potential for development, JTWC is notified. Once JTWC issues either a formation alert or warning, the network is tasked to provide three products: tropical cyclone positions, intensity estimates, and 24-hour intensity forecasts. Satellite tropical cyclone positions are assigned position code numbers (PCN) depending on the availability of geography for precise gridding and the degree of organization of the tropical cyclone's circulation center (Table 2-2). During 1982, the network provided JTWC with a total of 2026 satellite fixes on tropical systems in the western North Pacific. Another 146 were made for tropical systems in the North Indian Ocean. A comparison of those fixes made on numbered tropical cyclones in the western North Pacific with their corresponding JTWC best track positions is shown in Table 2-3. Estimates of the tropical cyclone's current intensity and a 24-hour intensity forecast are made once each day by applying the Dvorak technique (NOAA Technical Memorandum NESS 45 as revised) to daylight visual data.

The availability of polar-orbiting meteorological satellites declined again in 1982, after an improvement in 1981. At the beginning of 1982, there were three polar-orbiting satellites available; F-3 (FTV 14537) with limited coverage and availability, and NOAA 6 and 7 which were functioning normally. In February, NOAA 6 developed scanning problems and provided very little imagery data except for brief periods through most of the 1982 season. In November, the problem was corrected and NOAA 6 began functioning normally once again. NOAA 7, with nearly 8,000 orbits at the end of 1982, provided excellent data throughout the year and served as the network's primary reconnaissance satellite. A DMSP spacecraft, F-6 (FTV 17540), was launched on 20 December and is expected to be operational in January, 1983. F-6 replaces F-3 and may become the network's primary reconnaissance satellite in 1983. The outlook for 1983 looks even better, with projected launches of NOAA-E in February and F-7 in the latter part of the year.

TABLE 2-2. POSITION CODE NUMBERS

PCN	METHOD OF CENTER DETERMINATION/GRIDDING
1	EYE/GEOGRAPHY
2	EYE/EPHEMERIS
3	WELL DEFINED CC/GEOGRAPHY
4	WELL DEFINED CC/EPHEMERIS
5	POORLY DEFINED CC/GEOGRAPHY
6	POORLY DEFINED CC/EPHEMERIS

CC = Circulation Center

TABLE 2-3. MEAN DEVIATION (NM) OF ALL SATELLITE DERIVED TROPICAL CYCLONE POSITIONS FROM THE JTWC BEST TRACK POSITIONS. NUMBER OF CASES (IN PARENTHESES).

	WESTERN NORTH PACIFIC OCEAN		NORTH INDIAN OCEAN	
	1974-1981 AVERAGE	1982	1980-1981 AVERAGE	1982
PCN	(ALL SITES)	(ALL SITES)	(ALL SITES)	(ALL SITES)
1	13.7 (428)	12.9 (109)	17.0 (9)	15.4 (18)
2	17.9 (85)	11.5 (291)	9.5 (2)	8.5 (2)
3	19.5 (652)	16.8 (113)	29.7 (6)	15.8 (3)
4	24.4 (120)	15.7 (293)	(0)	19.1 (3)
5	36.6 (1514)	32.3 (325)	32.0 (22)	33.3 (43)
6	44.1 (317)	32.8 (732)	37.0 (33)	33.6 (31)
1&2	14.4 (513)	11.9 (400)	15.6 (11)	14.7 (20)
3&4	20.4 (772)	16.0 (406)	29.7 (6)	17.5 (6)
5&6	37.9 (1831)	32.6 (1057)	35.0 (55)	33.4 (74)

Besides fixes from the network, JTWC also received satellite-derived tropical cyclone positions from several secondary sources during 1982. These included: U.S. Navy ships equipped for direct readout; the National Environmental Satellite Service (NESS) using NOAA and GOES data; and the Naval Polar Oceanography Center, Suitland, Maryland using stored DMSP and NOAA data. Fixes from these secondary sources are not included in the network statistics.

5. RADAR RECONNAISSANCE SUMMARY

Eighteen of the 28 significant tropical cyclones occurring over the western North Pacific during 1982 passed within range of land based radars with sufficient cloud pattern organization to be fixed. The hourly and oftentimes, half-hourly land radar fixes that were obtained and transmitted to JTWC totaled 475.

The WMO radar code defines three categories of accuracy: good (within 10 km (5 nm)), fair (within 10 to 30 km (5 to 16 nm)), and poor (within 30 to 50 km (16 to 23 nm)). This year, 475 radar fixes were coded in this manner; 243 were good, 145 fair, and 87 poor. Compared to the JTWC best track, the mean vector deviation for land radar sites was 16 nm (30 km). Excellent support through timely and accurate radar fix positioning allowed JTWC to track and forecast tropical cyclone movement through even the most difficult and erratic tracks.

No radar fixes were made by reconnaissance aircraft during the 1982 tropical cyclone season in the western North Pacific area and, as in previous years, no radar reports were received on North Indian Ocean tropical cyclones.

6. TROPICAL CYCLONE FIX DATA

A total of 2970 fixes on 28 western North Pacific tropical cyclones and 127 fixes on five North Indian Ocean tropical cyclones were received at JTWC. Table 2-4, Fix Platform Summary, delineates the number of fixes per platform for each individual tropical cyclone. Season totals and percentages are also indicated.

Annex A includes individual fix data for each tropical cyclone. Fix data are divided into four categories: Satellite, Aircraft, Radar, and Synoptic. Those fixes labelled with an asterisk (*) were determined to be unrepresentative of the surface center and were not used in determining the best tracks. Within each category, the first three columns are as follows:

FIX NO. - Sequential fix number

TIME (Z) - GMT time in day, hours and minutes

FIX POSITION - Latitude and longitude to the nearest tenth of a degree

Depending upon the category, the remainder of the format varies as follows:

a. Satellite

(1) ACCRY - Position Code Number (PCN) is used to indicate the accuracy of the fix positon. A "1" indicates relatively high accuracy and a "6" relatively low accuracy.

(2) DVORAK CODE - Intensity evaluation and trend utilizing visual satellite data (Figure 2-1, Table 2-5). (For specifics, refer to NOAA TM; NESS-45)

(3) COMMENTS - For explanation of abbreviations, see Appendix I.

(4) SITE - ICAO call sign of the specific satellite tracking station.

b. Aircraft

(1) FLT LVL - The constant pressure surface level, in millibars or altitude, in feet, maintained during the penetration. The normal level flown in developed tropical cyclones, due to turbulence factors, is 700 mb. Low-level missions are normally flown at 1500 ft (457 m).

(2) 700 MB HGT - Minimum height of the 700 mb pressure surface within the vortex recorded in meters.

TABLE 2-4. FIX PLATFORM SUMMARY FOR 1982

FIX PLATFORM SUMMARY

WESTERN NORTH PACIFIC	AIRCRAFT	SATELLITE	RADAR	SYNOPTIC	TOTAL
TS MAMIE	7	68	3	--	78
TY NELSON	25	105	11	--	141
TY ODESSA	15	55	--	--	70
TY PAT	16	52	6	1	75
TY RUBY	15	63	--	--	78
TS TESS	--	40	--	8	48
TS SKIP	4	25	--	1	30
TS VAL	2	14	--	4	20
TS WINONA	16	86	92	3	197
TY ANDY	11	72	14	--	97
STY BESS	30	101	4	4	139
TY CECIL	16	82	38	7	143
TY DOT	23	66	3	2	94
TY ELLIS	24	87	64	3	178
TY FAYE	27	133	41	3	204
TY GORDON	36	90	--	--	126
TS HOPE	1	26	2	4	33
TY IRVING	13	109	59	7	188
TY JUDY	26	68	10	5	109
TY KEN	33	84	32	3	152
TS LOLA	--	28	--	--	28
TD 22	2	10	--	--	12
STY MAC	32	73	35	--	140
TY NANCY	19	80	14	2	115
TD 25	1	15	--	--	16
TY OWEN	27	128	--	--	155
TY PAMELA	44	160	22	3	229
TY ROGER	3	44	25	3	75
TOTAL	468	1964	475	63	2970
% OF TOTAL NR OF FIXES	15.8	66.1	16.0	2.1	100.0

INDIAN OCEAN	SATELLITE	SYNOPTIC	TOTAL
TC 20-82	46	--	46
TC 22-82	31	--	31
TC 23-82	29	--	29
TC 24-82	6	1	7
TC 25-82	10	4	14
TOTAL	122	5	127
% OF TOTAL NR OF FIXES	96.1	3.9	100.0

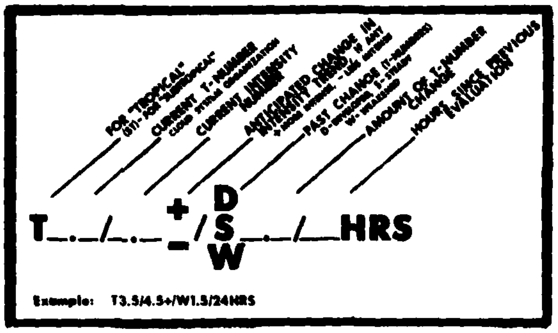


Figure 2-1. The current T-number is 3.5 but the current intensity estimate is 4.5 (equivalent to 77 kt). The cloud system has weakened by 1.5 T-numbers since the previous evaluation conducted 24 hours earlier. The plus (+) symbol indicates an expected reversal of the weakening trend or very little further weakening of the tropical cyclone during the next 24-hour period.

TABLE 2-5. MAXIMUM SUSTAINED WIND SPEED (KT) AS A FUNCTION OF DVORAK CI & FI (CURRENT & FORECAST INTENSITY) NUMBER AND MINIMUM SEA LEVEL PRESSURE (MSLP)

TROPICAL CYCLONE INTENSITY NUMBER	WIND SPEED	MSLP (NW PACIFIC)
1.0	25	--
1.5	25	--
2.0	30	1003
2.5	35	999
3.0	45	994
3.5	55	988
4.0	65	981
4.5	77	973
5.0	90	964
5.5	102	954
6.0	115	942
6.5	127	929
7.0	140	915
7.5	155	900
8.0	170	884

(3) OBS MSLP - If the surface center can be visually detected (e.g., in the eye), the minimum sea level pressure is obtained by a dropsonde released above the surface vortex center. If the fix is made at the 1500-foot level, the sea level pressure is extrapolated from that level.

(4) MAX-SFC-WND - The maximum surface wind (knots) is an estimate made by the ARWO based on sea state. This observation is limited to the region of the flight path and may not be representative of the entire tropical cyclone. Availability of data is also dependent upon the absence of undercast conditions and the presence of adequate illumination. The positions of the maximum flight level wind and the maximum observed surface wind do not necessarily coincide.

(5) MAX-FLT-LVL-WND - Wind speed (knots) at flight level is measured by the AN/APN 147 doppler radar system aboard the WC-130 aircraft. Values entered in this category represent the maximum wind measured prior to obtaining a scheduled fix. This measurement may not represent the maximum flight level wind associated with the tropical cyclone because the aircraft only samples those portions of the tropical cyclone along the flight path. In many instances, the flight path is through the weak sector of the tropical cyclone. In areas of heavy rainfall, the doppler radar may track energy reflected from precipitation rather than from the sea surface, thus, preventing accurate wind speed measurement. In obvious cases, such erroneous wind data will not be reported. In addition, the doppler radar systen on the WC-130 restricts wind measurements to drift angles less than or equal to 27 degrees if the wind is normal (perpendicular) to the aircraft heading.

(6) ACCRY - Fix position accuracy. Both navigational (OMEGA and LORAN) and meteorological (by the ARWO) estimates are given in nautical miles.

(7) EYE SHAPE - Geometrical representation of the eye based on the aircraft radar presentation. The eye shape is reported only if the center is 50 percent or more surrounded by wall cloud.

(8) EYE DIAM/ORIENTATION - Diameter of the eye in nautical miles. When an elliptical eye is present, the lengths of the major and minor axes and the orientation of the major axis are respectively listed. When concentric eye walls are present, each diameter is listed.

c. Radar

(1) RADAR - Specific type of platform (land, aircraft, or ship) utilized for fix.

(2) ACCRY - Accuracy of fix position (good, fair, or poor) as given in the WMO ground radar weather observation code (FM20-V).

(3) EYE SHAPE - Geometrical representation of the eye given in plain language (circular, elliptical, etc.).

(4) EYE DIAM - Diameter of eye given in kilometers.

(5) RADOB CODE - Taken directly from WMO ground weather radar observation code FM20-V. The first group specifies the vortex parameters, while the second group describes the movement of the vortex center.

(6) RADAR POSITION - Latitude and longitude of tracking station given in tenths of a degree.

(7) SITE - WMO station number of the specific tracking station.

CHAPTER III - SUMMARY OF TROPICAL CYCLONES

1. WESTERN NORTH PACIFIC TROPICAL CYCLONES

During 1982, the western North Pacific experienced the fourth consecutive year of below average tropical cyclone activity. Twenty-eight tropical cyclones occurred in 1982, three and one-half less than the annual average. Only two significant tropical cyclones failed to develop beyond the tropical depression (TD) stage and seven tropical storms (TS) failed to reach typhoon intensity. Of the 19 tropical cyclones that developed to typhoon (TY) intensity (the highest frequency since 1972), only two reached the 130 kt (67 m/sec) intensity necessary to be classified as super typhoons (STY). In the western North Pacific, tropical cyclones reaching tropical storm intensity or greater are assigned names in alphabetical order from a list of alternating male/female names (refer to Appendix 3). Table 3-1 provides a summary of key statistics for western North Pacific tropical cyclones. Each tropical cyclone's maximum surface winds (in knots) and minimum observed sea level pressure (in millibars) were obtained from best estimates based on all available data. The distance traveled (in nautical miles) was calculated from the JTWC official best tracks (see Annex A).

Table 3-2 through 3-5 provide further information on the monthly distribution of tropical cyclones and statistics on Tropical Cyclone Formation Alerts and Warnings.

TABLE 3-1. WESTERN NORTH PACIFIC

1982 SIGNIFICANT TROPICAL CYCLONES

TROPICAL CYCLONE		PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	OBSERVED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
01	TS MAMIE	16 MAR - 24 MAR	9	35	60	990	2733
02	TY NELSON	19 MAR - 1 APR	14	53	105	934	3063
03	TY ODESSA	29 MAR - 4 APR	7	25	75	964	1528
04	TY PAT	17 MAY - 23 MAY	7	24	105	947	1994
05	TY RUBY	21 JUN - 27 JUN	7	25	75	970	2173
06	TS TESS	29 JUN - 2 JUL	4	14	35	999	585
07	TS SKIP	30 JUN - 1 JUL	2	8	50	991	1197
08	TS VAL	3 JUL - 4 JUL	2	7	55	987	867
09	TS WINONA	12 JUL - 17 JUL	6	22	55	985	1486
10	TY ANDY	22 JUL - 30 JUL	9	32	120	920	2072
11	STY BESS	22 JUL - 2 AUG	12	43	140	901	2811
12	TY CECIL	5 AUG - 14 AUG	10	39	125	914	1665
13	TY DOT	9 AUG - 15 AUG	7	27	80	960	2435
14	TY ELLIS	18 AUG - 27 AUG	10	36	125	913	2640
15	TY FAYE	21 AUG - 3 SEP	14	50	90	960	2454
16	TY GORDON	27 AUG - 5 SEP	10	38	100	944	2014
17	TS HOPE	4 SEP - 6 SEP	3	10	60	979	630
18	TY IRVING	5 SEP - 16 SEP	12	44	90	952	1778
19	TY JUDY	5 SEP - 12 SEP	8	29	90	953	2133
20	TY KEN	16 SEP - 25 SEP	10	37	110	936	1647
21	TS LOLA	16 SEP - 19 SEP	4	12	50	993	1424
22	TD 22	21 SEP - 22 SEP	2	5	30	1001	282
23	STY MAC	1 OCT - 9 OCT	9	32	140	895	2287
24	TY NANCY	11 OCT - 18 OCT	8	29	115	926	2400
25	TD 25	15 OCT - 16 OCT	2	5	20	1002	228
26	TY OWEN	15 OCT - 27 OCT***	12	40	105	939	3604
27	TY PAMELA	24 NOV - 9 DEC	16	60	100	940	4291
28	TY ROGER	8 DEC - 10 DEC	3	12	65	985	906
		1982 TOTALS:	150*	793**			

* OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM
** IN ADDITION 17 AMENDED WARNINGS WERE ISSUED DURING 1982
*** NO WARNINGS WERE ISSUED FOR TY OWEN ON 23 OCTOBER

TABLE 3-2.

1982 SIGNIFICANT TROPICAL CYCLONES

WESTERN NORTH PACIFIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	(1959-1981) AVERAGE	CASES
TROPICAL DEPRESSIONS	0	0	0	0	0	0	0	0	1	1	0	0	2	4.0	91
TROPICAL STORMS	0	0	1	0	0	2	2	0	2	0	0	0	7	9.8	225
TYPHOONS	0	0	2	0	1	1	2	5	3	3	1	1	19	17.8	409
ALL TROPICAL CYCLONES	0	0	3	0	1	3	4	5	6	4	1	1	28	31.5	725
1959-1981														PREVIOUS	
AVERAGE	.6	.3	.7	1.0	1.4	2.0	5.0	6.3	5.9	4.4	2.7	1.4	31.5	23-YEAR	
CASES	13	8	15	22	32	45	115	144	136	101	62	32	725	HISTORY	

FORMATION ALERTS: 26 of 36 Formation Alert Events developed into significant tropical cyclones. Tropical Cyclone Formation Alerts were issued for all but two of the significant tropical cyclones that developed during 1982.

WARNINGS:		
	Number of warning days:	150
	Number of warning days with two tropical cyclones in region:	56
	Number of warning days with three or more tropical cyclones in region:	6

TABLE 3-3.

FREQUENCY OF TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.3	.4	.7	1.1	2.0	2.9	3.2	2.4	2.0	.9	16.3
1959	0	0	0	1	0	0	1	5	3	3	2	2	17
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
1973	0	0	0	0	0	0	4	2	2	4	0	0	12
1974	0	0	0	0	1	2	1	2	3	4	2	0	14
1975	1	0	0	0	0	0	1	3	4	3	2	0	15
1976	1	0	0	1	2	2	2	1	4	1	1	0	15
1977	0	0	0	0	0	0	3	0	2	3	2	1	11
1978	0	0	0	1	0	0	3	2	4	3	2	0	15
1979	1	0	1	1	0	0	2	2	3	2	1	1	14
1980	0	0	0	0	2	0	3	2	5	2	1	0	15
1981	0	0	1	0	0	2	2	2	4	1	2	2	16
1982	0	0	2	0	1	1	2	5	3	3	1	1	19
(1959-1982) AVERAGE	.3	.04	.3	.6	.9	1.0	2.8	3.4	3.3	3.0	1.6	.7	17.8
CASES	6	1	6	15	20	23	66	81	80	72	38	15	423

TABLE 3-4.

FREQUENCY OF TROPICAL STORMS AND TYPHOONS BY MONTH AND YEAR

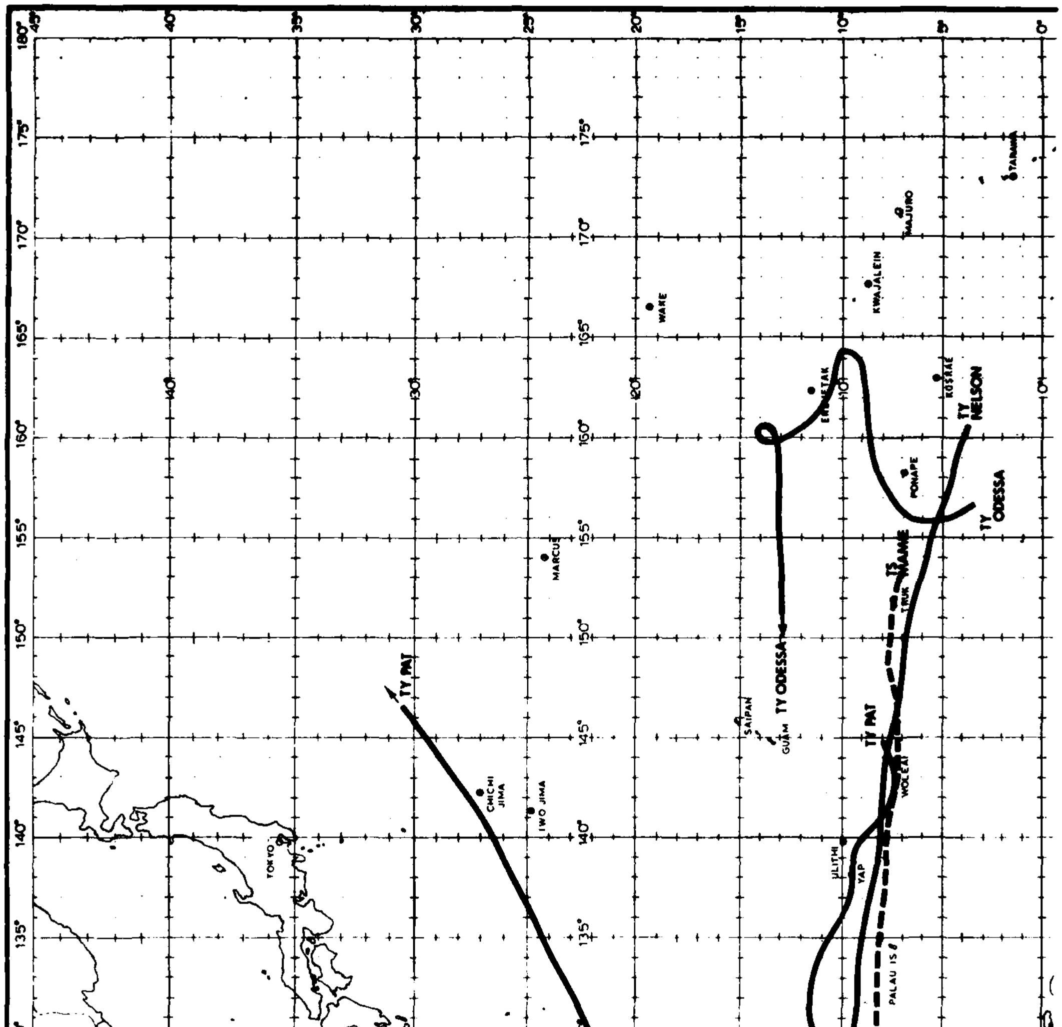
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.4	.5	.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	21.6
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
1976	1	1	0	2	2	2	4	4	5	1	1	2	25
1977	0	0	1	0	0	1	4	1	5	4	2	1	19
1978	1	0	0	1	0	3	4	7	5	4	3	0	28
1979	1	0	1	1	1	0	4	2	7	3	2	2	24
1980	0	0	0	1	4	1	4	2	6	4	1	1	24
1981	0	0	1	2	0	2	5	7	4	2	3	2	28
1982	0	0	3	0	1	3	4	5	5	3	1	1	26
(1959-1982) AVERAGE	.5	.3	.6	.9	1.2	1.6	4.5	5.4	5.0	4.0	2.4	1.2	27.5
CASES	12	7	14	21	29	39	108	130	120	95	57	28	660

TABLE 3-5.

FORMATION ALERT SUMMARY

WESTERN NORTH PACIFIC

YEAR	NUMBER OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1972	41	29	32	71%
1973	26	22	23	85%
1974	35	30	36	86%
1975	34	25	25	74%
1976	34	25	25	74%
1977	26	20	21	77%
1978	32	27	32	84%
1979	27	23	28	85%
1980	37	28	28	76%
1981	29	28	29	97%
1982	36	26	28	72%
(1972-1982) AVERAGE	32.5	25.7	27.9	79%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TY ODESSA
TY NELSON
TS MAMIE
SEOUL
TOKYO
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
SINGAPORE
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
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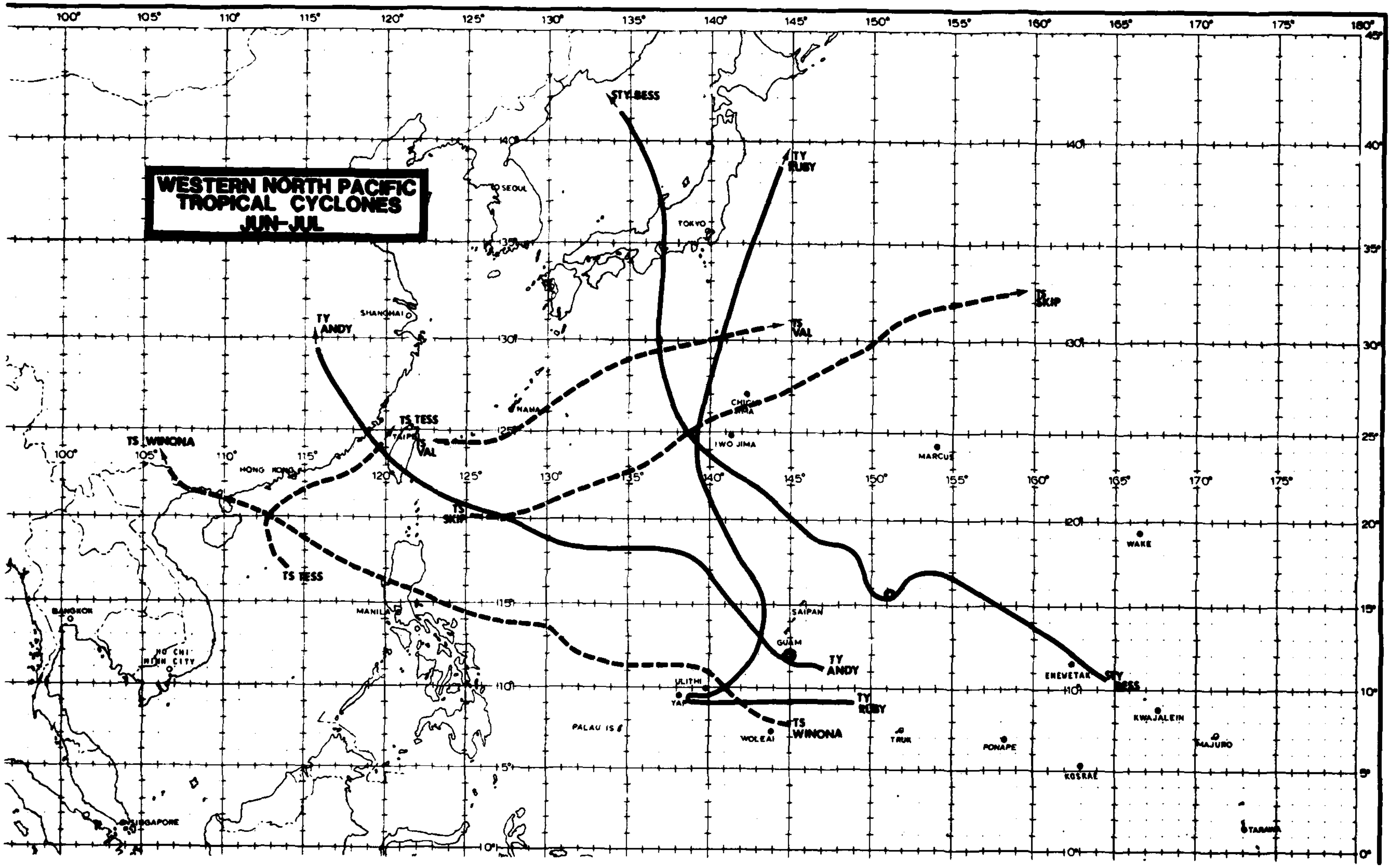
WOLEAI
TRUK
PONAPE
KOSRAE
KWAJALEIN
MAJURO
ENIWETAK
TARAWA


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
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STY BESS
TY RUBY
TS SKIP
TS VAL
TY ANDY
TS TESS
TS WINONA
TS SKIP
TY ANDY
TY RUBY
TS WINONA
STY BESS
SEOUL
TOKYO
SHANGHAI
HONG KONG
TAIPEI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
MANILA
BANGKOK
HO CHI MINH CITY
SINGAPORE
SAIPAN
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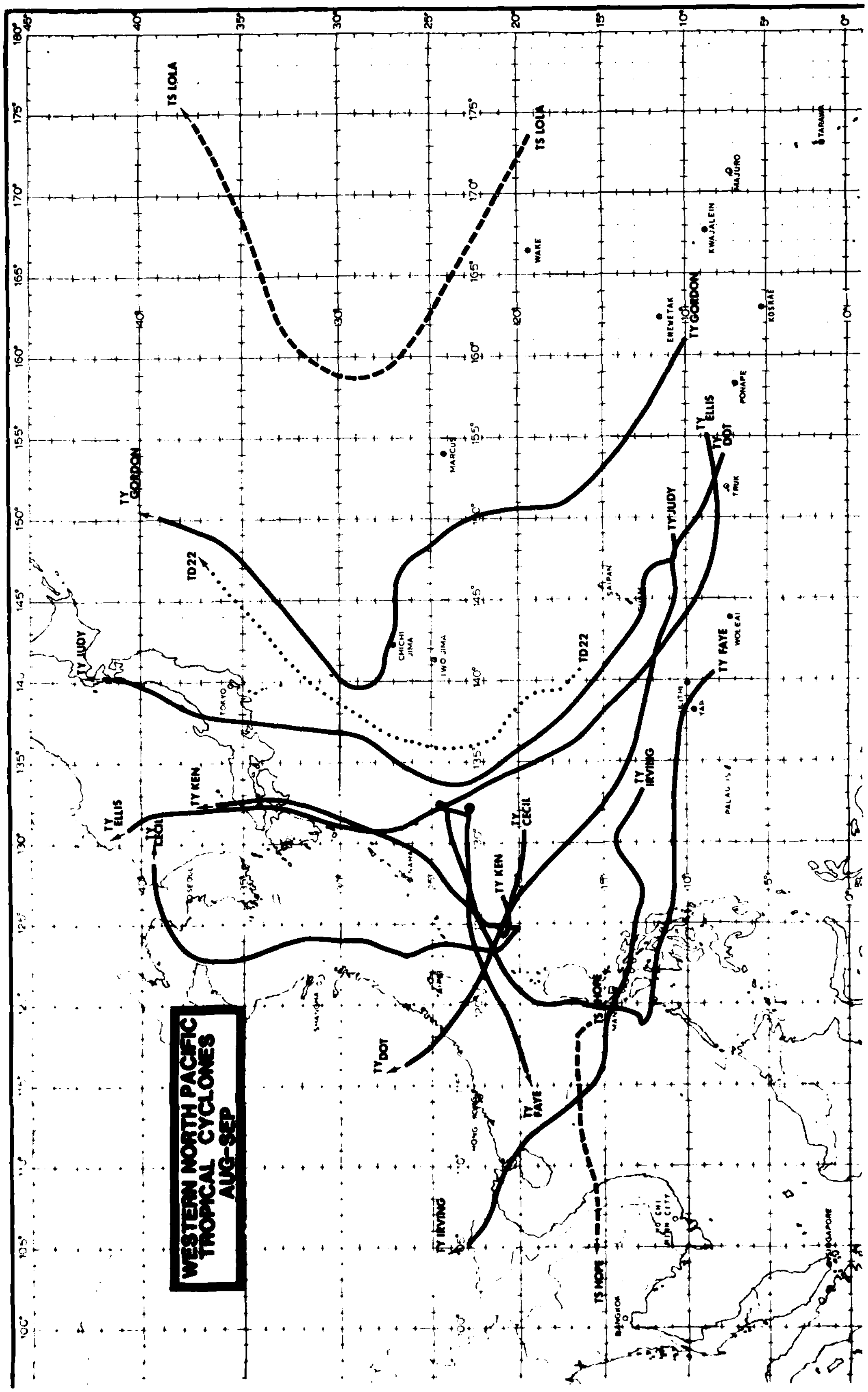
WESTERN NORTH PACIFIC
TROPICAL CYCLONES
AUG-SEP
TS LOLA
TS LOLA
TY GORDON
TY GORDON
TD22
TD22
TY JUDY
TY JUDY
TY ELLIS
TY ELLIS
TY DOT
TY DOT
TY FAYE
TY FAYE
TY IRVING
TY IRVING
TY KEN
TY KEN
TY CECIL
TY CECIL
TS HOPE
TS HOPE
MARCUS
WAKE
KWAJALEIN
MAJURO
TARAWA
ENEWETAK
PONAPE
KOSRAE
TRUK
SAIPAN
GUAM
CHICHI JIMA
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WOLEAI
YAP
PALAU IS
TOKYO
HONG KONG
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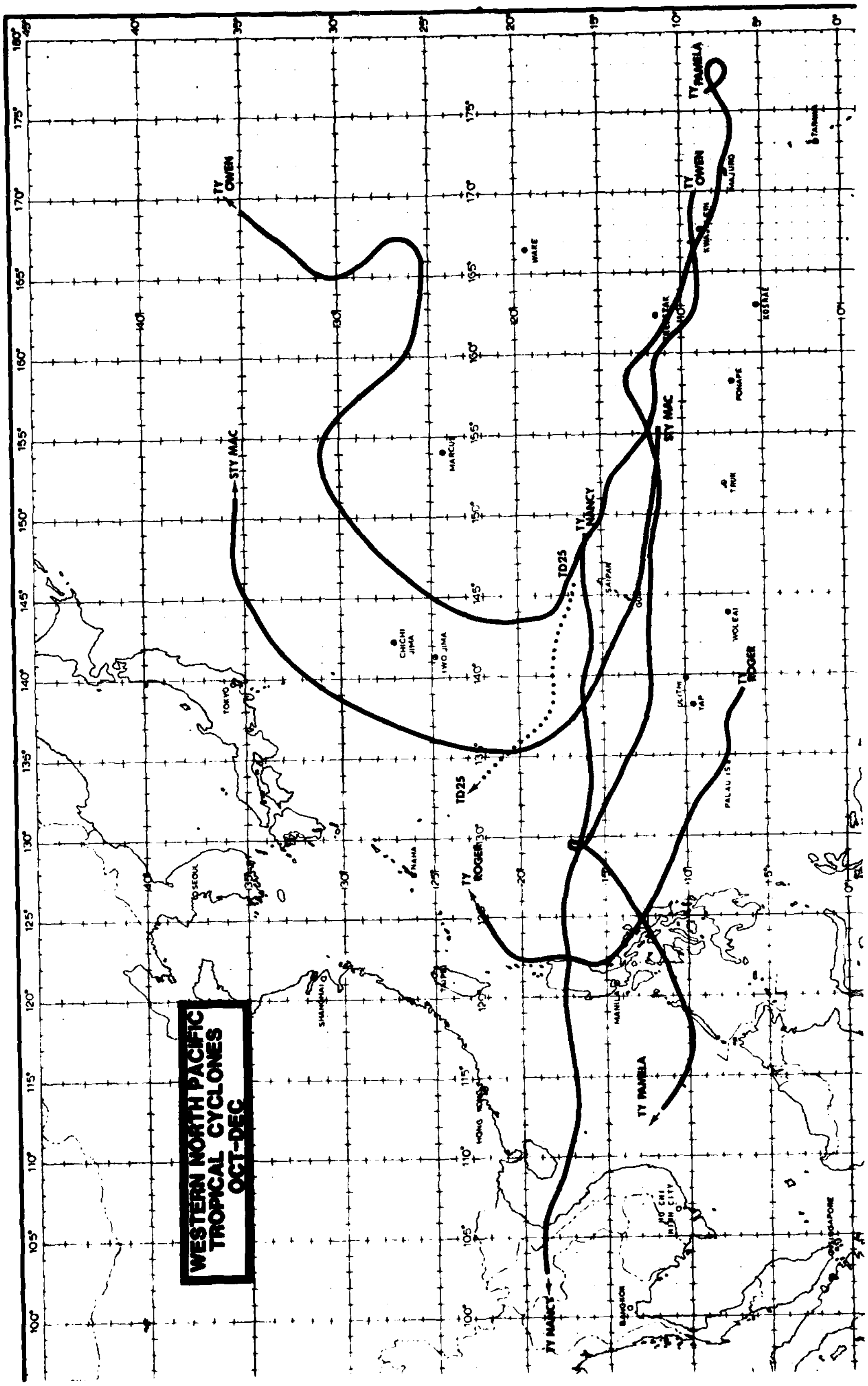
WESTERN NORTH PACIFIC
TROPICAL CYCLONES
OCT-DEC
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TY PAMELA
TY ROGER
TY OWEN
STY MAC
TD25
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
SINGAPORE
CHICHI JIMA
IWO JIMA
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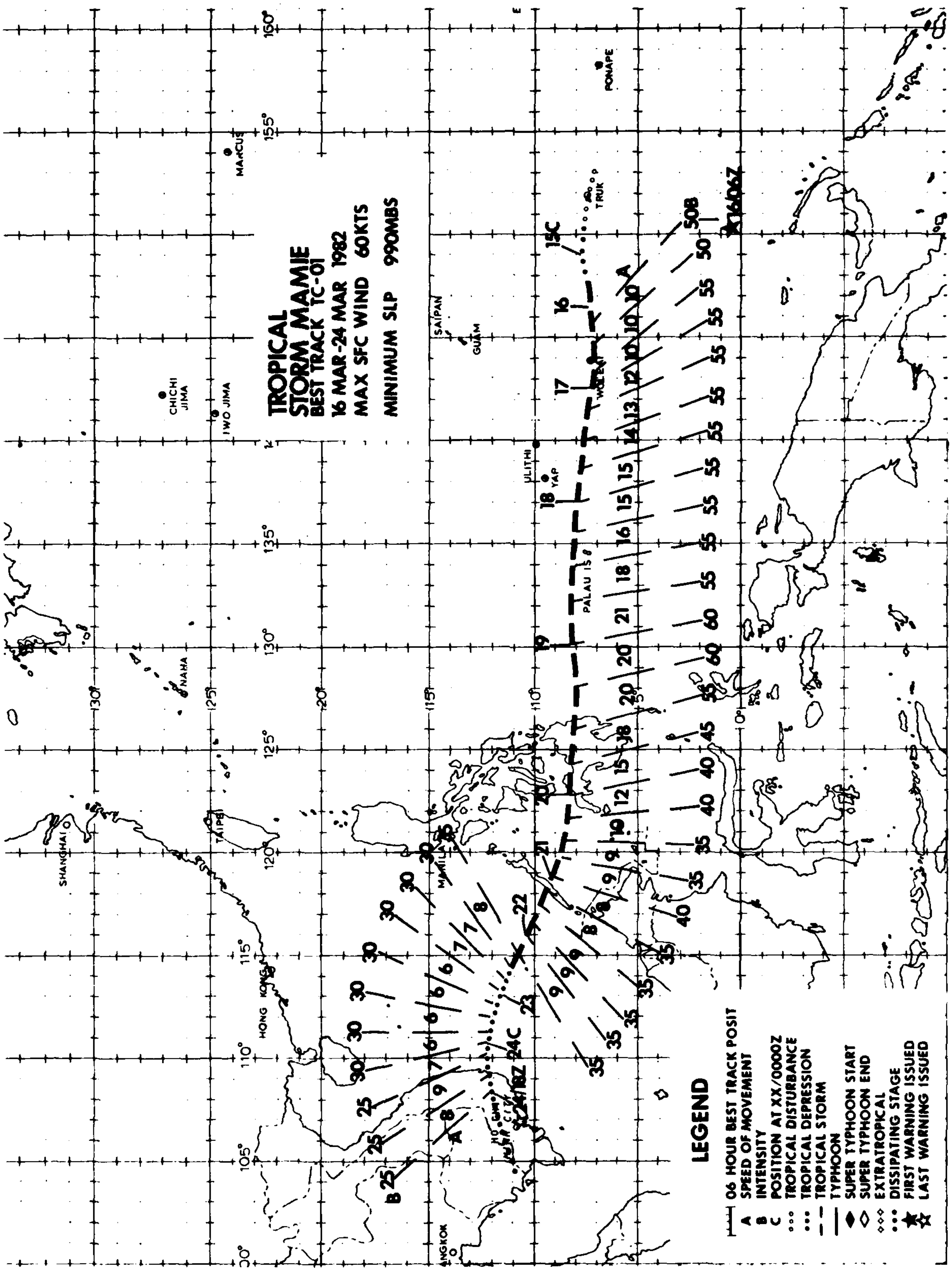

TROPICAL STORM MAMIE
BEST TRACK TC-01
16 MAR-24 MAR 1982
MAX SFC WIND 60KTS
MINIMUM SLP 990MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
TAIPEI
HONG KONG
MANILA
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
TRUK
PONAPE
105°
110°
115°
120°
125°
130°
135°
150°
155°

TROPICAL STORM MAMIE (01)

Tropical Storm Mamie, the first tropical cyclone of the season, developed from an area of active convection which was first sighted on 7 March, near 150E and just south of the equator (Figure 3-01-1). During the next five days, this convective area was observed migrating northward as the near-equatorial trough set up south of 05N. By 12 March, the convective organization was sufficient to warrant discussion in the Significant Tropical Weather Advisory (ABEH PGTW). On 14 March, the first satellite fix located the developing disturbance approximately 104 nm (193 km) east-southeast of Truk Atoll (WMO 91344). As the disturbance tracked westward and was followed on satellite imagery, the available synoptic data indicated a relatively weak wind field with surface pressures near normal (1010 mb). However, because satellite imagery showed continued convective organization, a reconnaissance aircraft was sent on an investigative mission which proved to be very enlightening. Upon receipt of observed winds of 50 kt (26 m/sec) and evidence of a closed circulation from the reconnaissance data, the first warning on Tropical Storm Mamie was issued immediately (160600Z). Mamie's intensities up to that point can only be extrapolated backwards; however, further intensification was very slow with the maximum intensity of 60 kt (31 m/sec) reached shortly before making landfall on Mindanao on 19 March.

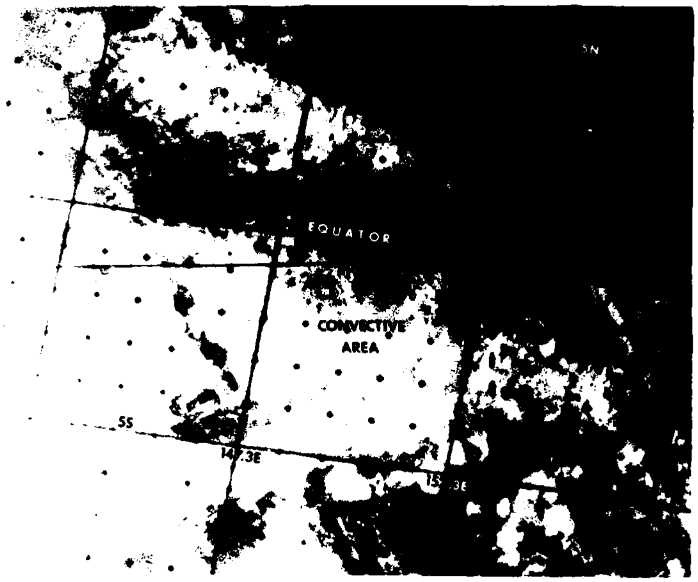


Figure 3-01-1. Satellite imagery shows an area of convection south of the equator which migrated northward and eventually became associated with the development of Tropical Storm Mamie, 070430Z March (NOAA 7 visual imagery).

From the first satellite fix to landfall on Mindanao, Mamie tracked westward along the southern periphery of a strong subtropical ridge (Figure 3-01-2). During this period, had it not been for satellite surveillance, Mamie may well have gone undetected until initial casualty reports were received from Mindanao (approximately 40 persons dead and extensive property and crop damage). Aside from winds received from the reconnaissance aircraft missions, no other surface observations were received which indicated a well-organized circulation. Even upon landfall, Mamie was not detectable from the observations of local reporting stations. Fortunately, given Mamie's track and compact circulation (less than 90 nm (167 km)), both satellite and aircraft reconnaissance platforms were available and Mamie was tracked and monitored despite the paucity of reporting stations and ships in the Philippine Sea.

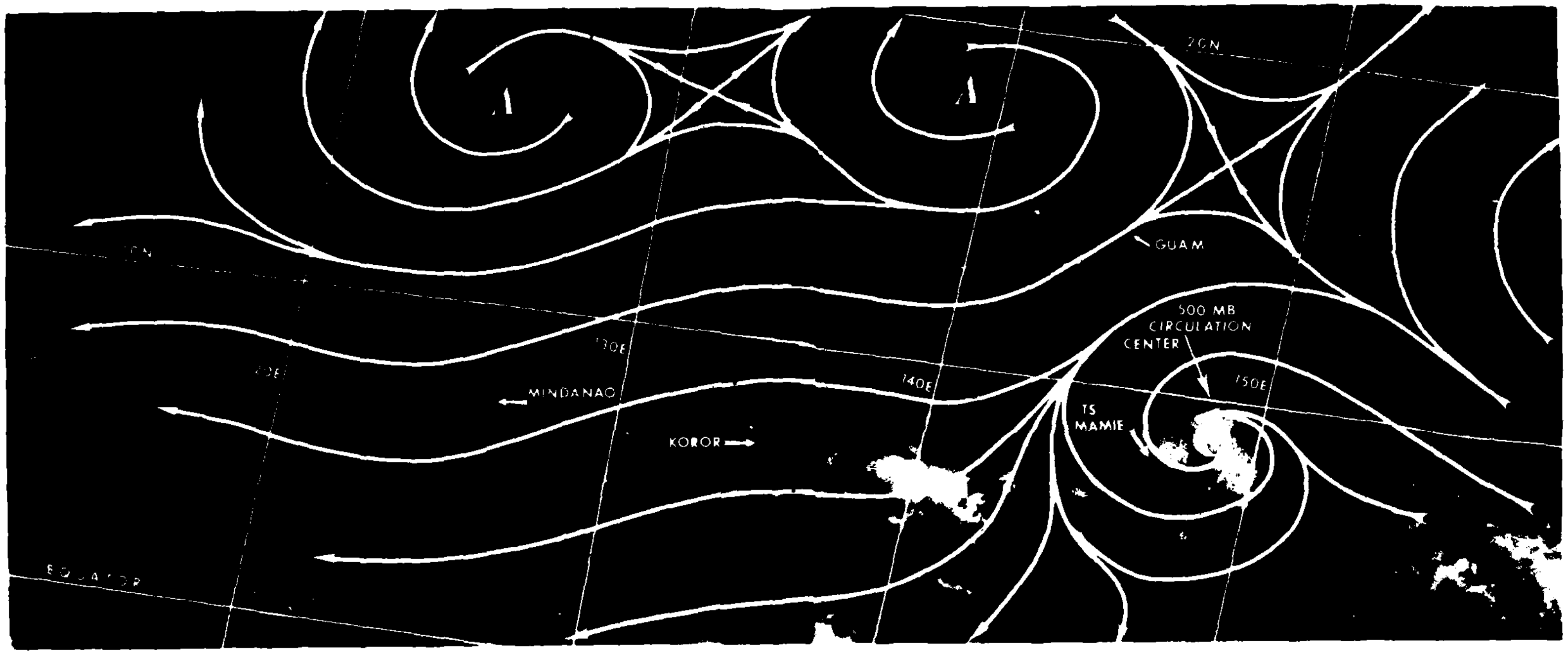
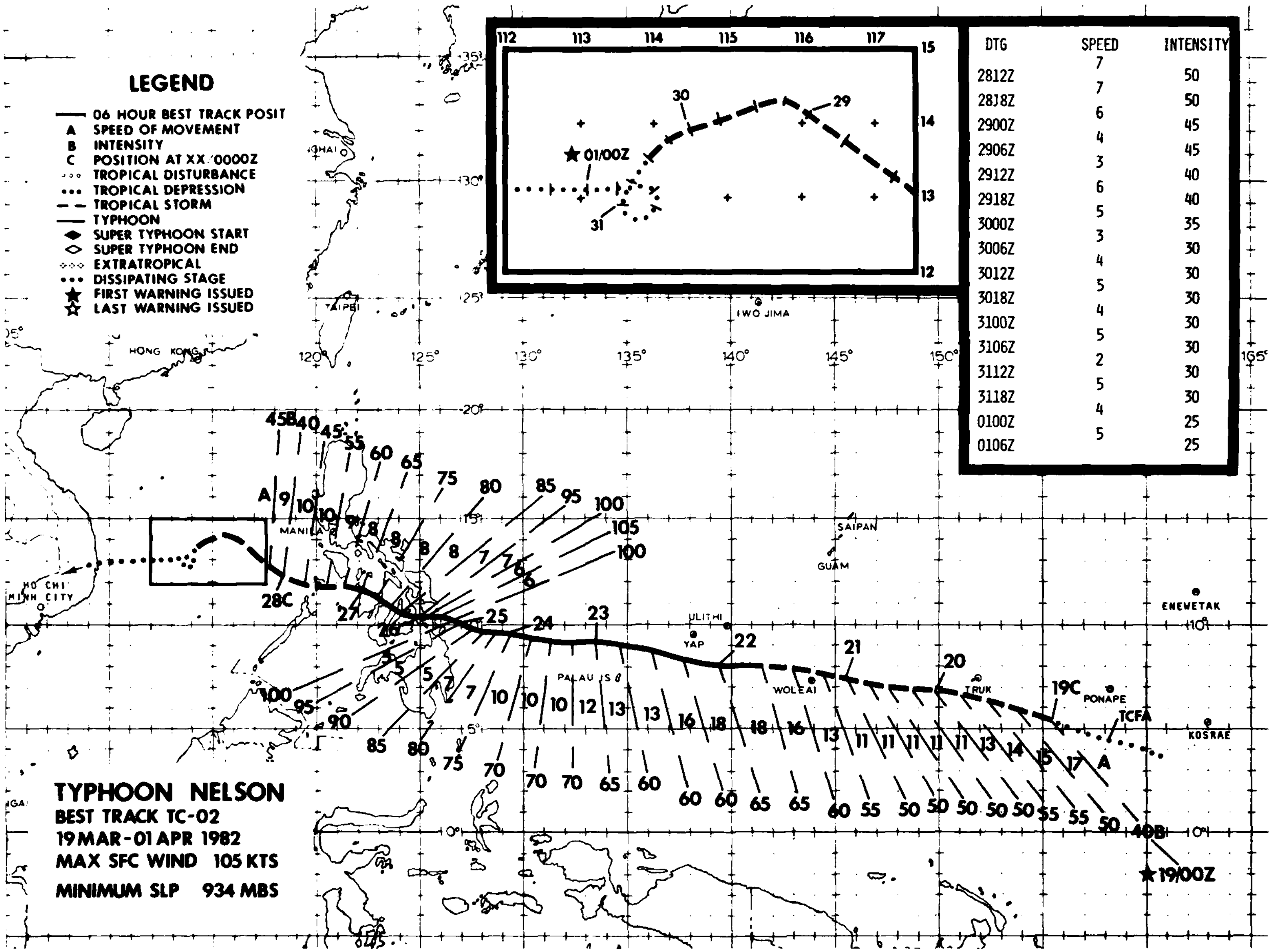


Figure 3-02-1. 500 mb streamline analysis for 150000Z March superimposed on a mosaic from visual satellite imagery. This figure depicts the steering influence of a strong subtropical ridge north of Tropical Storm Mamie. (150436Z and 150618Z March, NOAA 7 visual imagery).

On the second, and on subsequent reconnaissance aircraft missions, the Aerial Reconnaissance Weather Officers (ARWOs) observed an eyewall which was restricted to the lower levels. (Maximum observed height of the eyewall was near 10,000 ft (3048 m)). Due to Mamie's compactness and increasing vertical wind shear in the mid- and upper-tropospheric levels, the eyewall did not fully develop and extend to heights that could be observed on satellite imagery. This failure to develop in the vertical contributed to Mamie not reaching typhoon strength.

After tracking across the northern portion of Mindanao, Mamie entered the Sulu Sea with winds of 40 kt (21 m/sec) and was unable to reintensify despite surface conditions which were generally favorable for reintensification. On 21 March, as Mamie reached the South China Sea, a weakness in the subtropical ridge allowed a more northwestward track which was maintained until approximately 230000Z, when the ridge strengthened and Mamie resumed a westward movement. At 241200Z, Mamie made final landfall near Nha Trang, Vietnam and then dissipated in the mountainous region to the west.



DTG	SPEED	INTENSITY
2812Z	7	50
2818Z	7	50
2900Z	6	45
2906Z	4	45
2912Z	3	40
2918Z	6	40
3000Z	5	35
3006Z	3	30
3012Z	4	30
3018Z	5	30
3100Z	4	30
3106Z	5	30
3112Z	2	30
3118Z	5	30
0100Z	4	25
0106Z	5	25

Typhoon Nelson was the second of three early season tropical cyclones in the western North Pacific which formed at very low latitudes southeast of Guam. Nelson, similar to Mamie (01), was a well-behaved tropical cyclone which developed and tracked westward, south of a strong mid-tropospheric ridge (centered near 15N 150E and extending west-northwest toward Taiwan).

In the initial stages of development, Nelson intensified rapidly from a weak tropical disturbance to a full-fledged tropical storm. In fact, the Tropical Cyclone Formation Alert, which was issued just 10 hours before the first warning, was preceded and followed by satellite fixes (180900Z and 181800Z) which described very little convective organization. However, at 190615Z, a reconnaissance aircraft reported flight level (1500 ft (457 m)) winds of 66 kt (34 m/sec), surface winds of 50 kt (26 m/sec), and an extrapolated sea level pressure of 993 mb.

Nelson's rapid development was in response to a very strong divergence field in the upper-troposphere located over the cyclone, where a 40 to 60 kt (21 to 31 m/sec) easterly jet branched to the northwest and southwest. However, while these strong easterlies remained near Nelson, further development was limited to minimal typhoon strength. During this entire period, Nelson moved rapidly westward at speeds reaching 18 kt (33 km/hr) on 22 April, after which a gradual slowing in forward speeds and further intensification followed. After maintaining intensities between 60 and 70 kt (31 to 36 m/sec) for 60 hours, a change in the upper air patterns allowed Nelson to deepen rapidly, reaching 100 kt (51 m/sec) within 24 hours.

At 231200Z, while Nelson was moving away from the westernmost extent of the upper-tropospheric ridge (Figure 3-02-1), nearby westerlies aloft provided a strong outflow channel to the north and northeast.

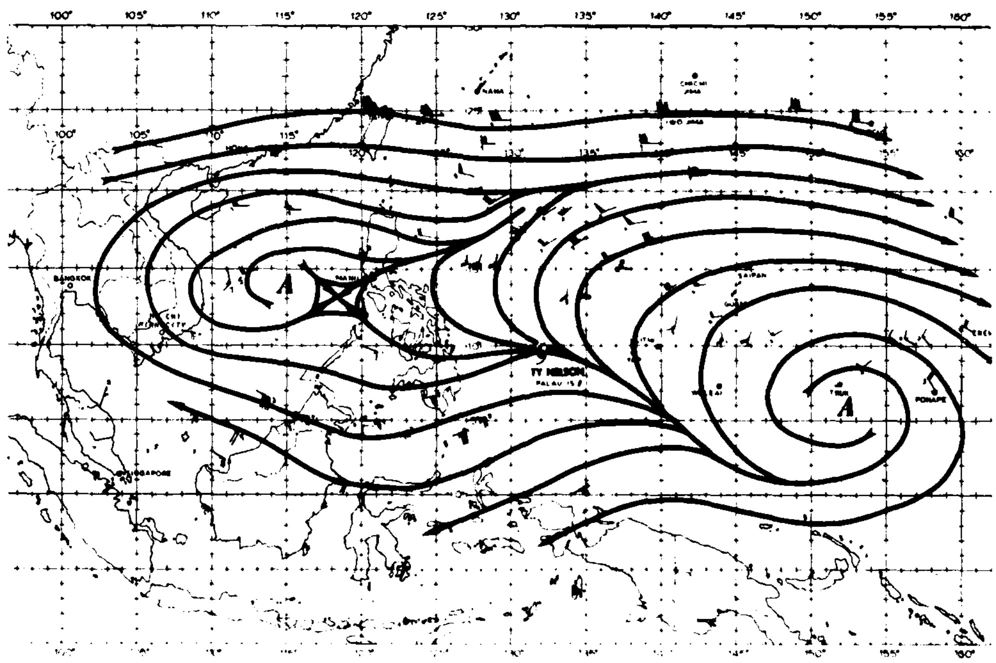


Figure 3-02-1. 200 mb analysis at 231200Z March. Note Typhoon Nelson's position just west of the westernmost portion of the ridge and the presence of a westerly current seven degrees north which will provide a good outflow channel.

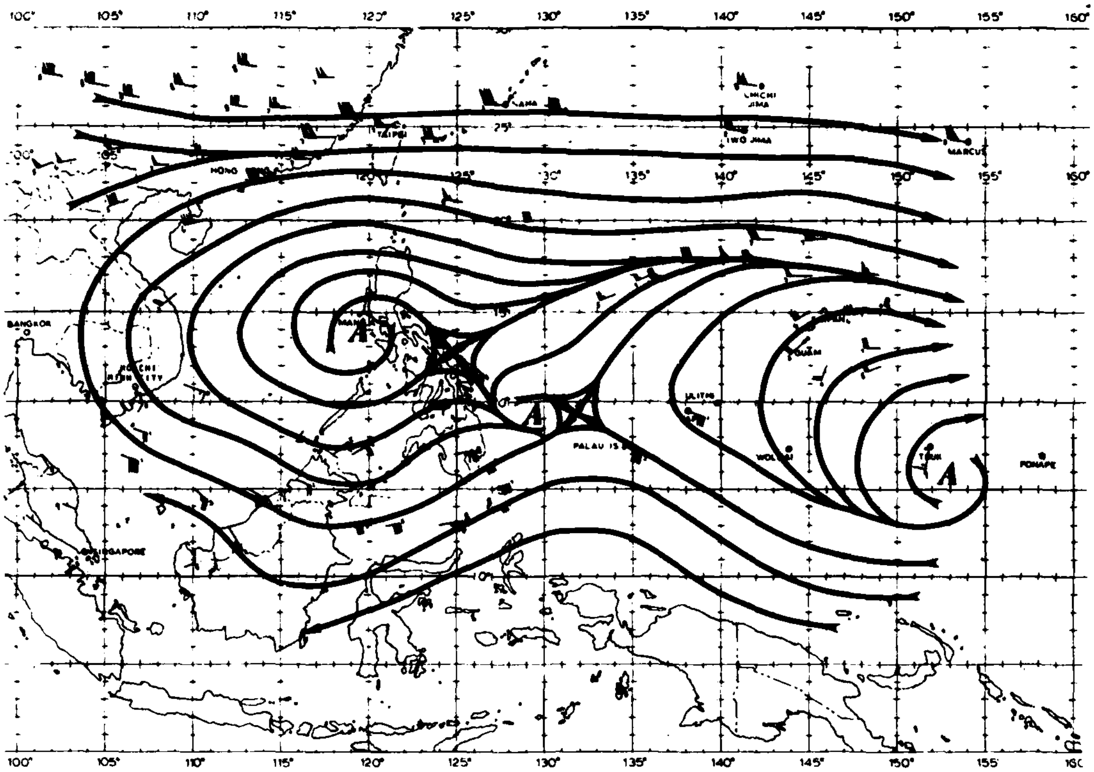


Figure 3-02-2. 200 mb analysis at 240000Z March. Within 12 hours an appreciable change in the upper-tropospheric levels has allowed the formation of an anticyclone aloft and the beginning of the good outflow channel into the westerlies.

As this occurred, an upper-level anticyclone was established (Figure 3-02-2) and intensified over Nelson; concurrently, Nelson responded and reached a maximum intensity of 105 kt (54 m/sec) at 251200Z (Figure 3-02-3).

On 27 March, a much weakened Tropical Storm Nelson entered the South China Sea after navigating through the south-central Philippines. On 28 March, Nelson briefly reintensified before weakening under the influence of vertical wind shear. Until 291200Z, the presence of a 500 mb short wave trough north of Nelson provided a favorable opportunity for recurvature toward the northeast. However, Nelson was quickly sheared and the low-level center meandered westward and eventually dissipated four days later. The fifty-third and final warning was issued at 010000Z April for Tropical Depression 02 (Nelson), approximately 240 nm (444 km) east of Nha Trang, Vietnam, near to the location where Tropical Storm Mamie (01) had made landfall one week earlier.

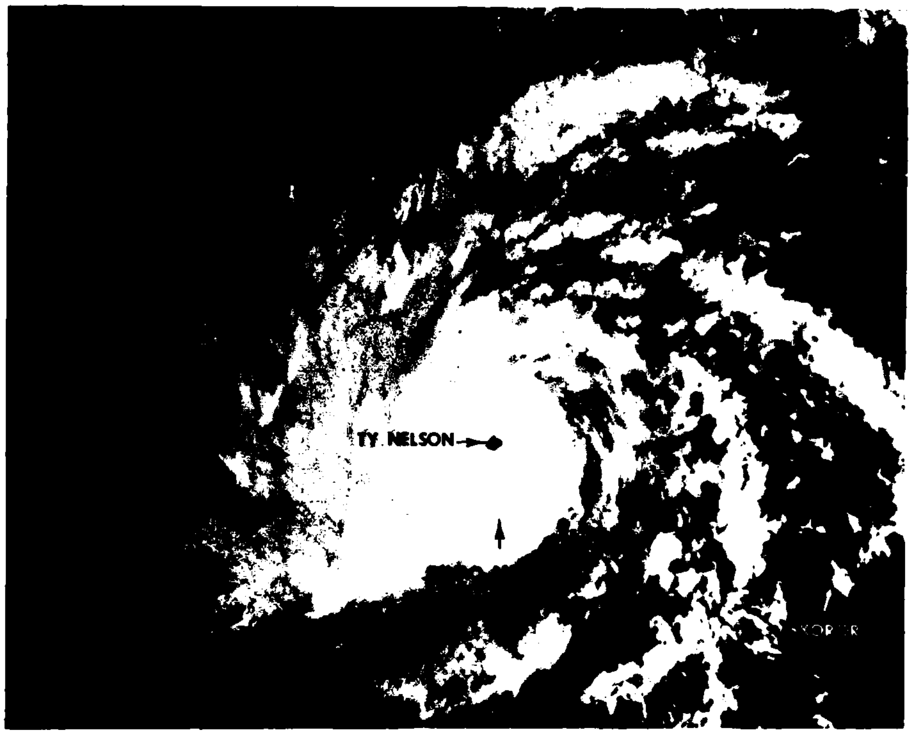
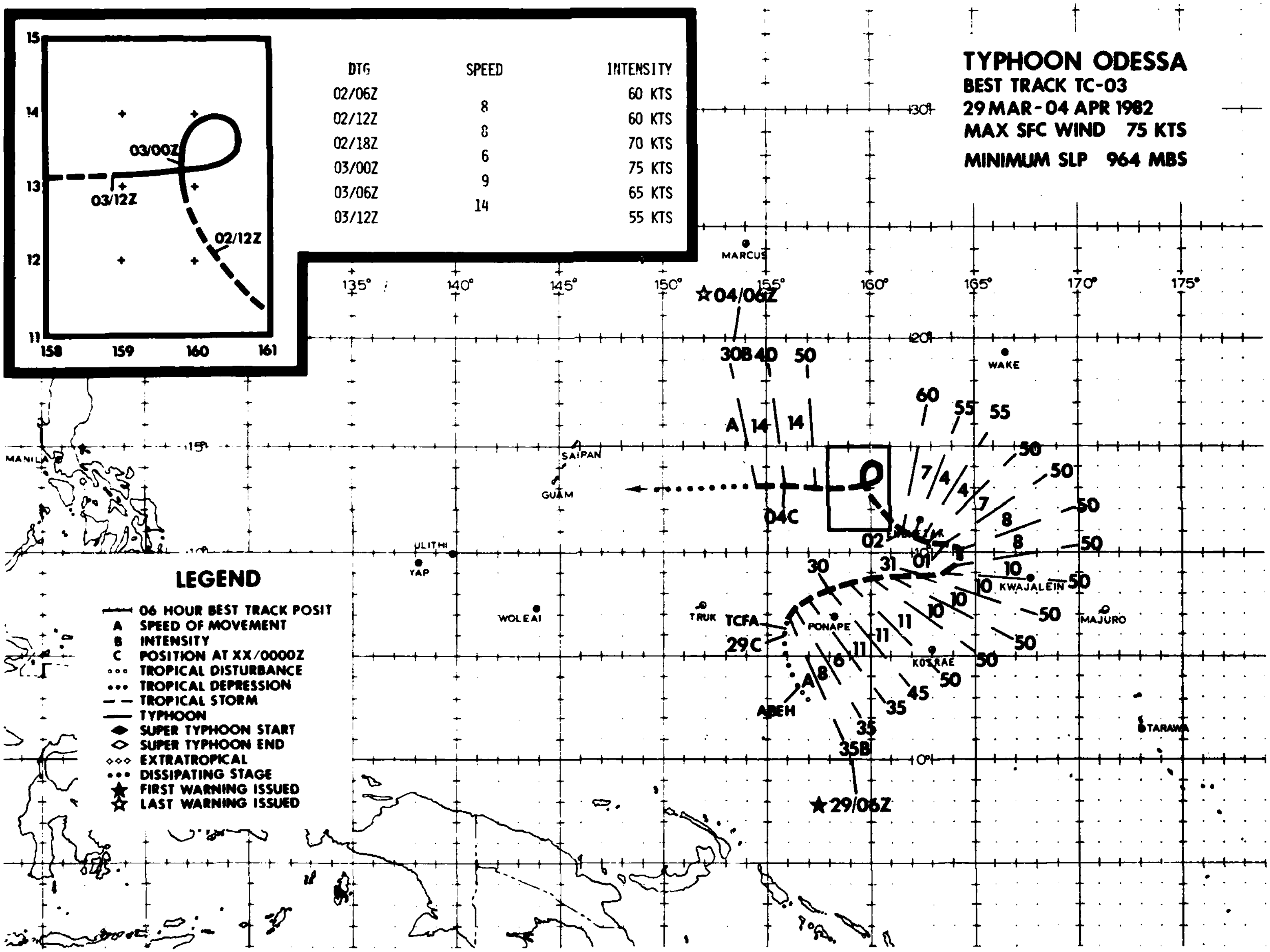


Figure 3-02-3. Typhoon Nelson near peak intensity, east of the Philippines. Note the anticyclonic flow aloft and the well-formed outflow channel to the north, 250601Z March. (NOAA 7 visual satellite imagery)



DTG	SPEED	INTENSITY
02/06Z		60 KTS
02/12Z	8	60 KTS
02/18Z	8	70 KTS
03/00Z	6	75 KTS
03/06Z	9	65 KTS
03/12Z	14	55 KTS

March is normally a relatively quiet month in the tropical western North Pacific, producing on the average less than one tropical cyclone per year. March 1982 was quite the contrary, with the genesis of three tropical cyclones taking place within a period of 13 days; 1967 was the most recent year with more than one tropical cyclone during March. Typhoon Nelson (02) and the subject of this report, Typhoon Odessa represent only the fifth and sixth typhoons to occur in March since the JTWC was established in 1959.

Just as March was a unique month in the level of tropical cyclone activity, Odessa was unique among the three tropical cyclones. As illustrated in Figure 3-03-1, tropical cyclones which develop near 160E tend to follow one of two climatological tracks: 60 percent move in a generally westward direction and 40 percent move in a generally northward direction. Although both Tropical Storm Mamie (01) and Typhoon Nelson (02) moved westward from this genesis area, Odessa's track defied climatology as it moved both eastward and westward across the area shown for northward-moving tropical cyclones.

Typhoon Odessa was initially detected as an area of loosely organized convection near 2N 159E on 26 March. In the following three days, a cloud system center emerged from these low-latitudes and moved northwestward. A Tropical Cyclone Formation Alert was issued at 290400Z upon receipt of reconnaissance aircraft data which indicated that a closed circulation had developed. As subsequent aircraft data and satellite imagery became available, it was evident that the circulation had rapidly organized and thus, at 290741Z, the initial warning was issued for Odessa with maximum surface winds of 35 kt (18 m/sec)

Much of the remaining discussion will concentrate on the meteorological factors which influenced Odessa's atypical track. To facilitate this discussion, Odessa's best track has been divided into four segments (Figure 3-03-2) representing the different track directions of the tropical cyclone. Each of these segments can be explained quite well in post-analysis when large-scale changes in the mid-latitudes at distances 600 to 1200 nm (1111 km to 2222 km) from Odessa are considered.

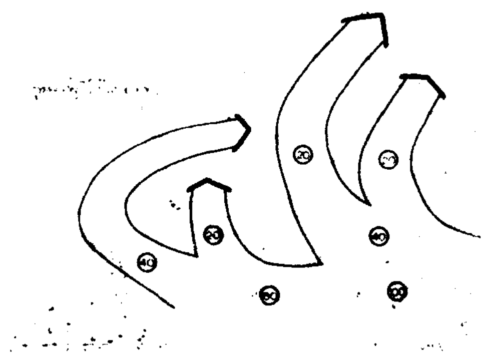


Figure 3-03-1. March Typhoon Climatology Tracks (1WW Special Study 105-8 March 1970)

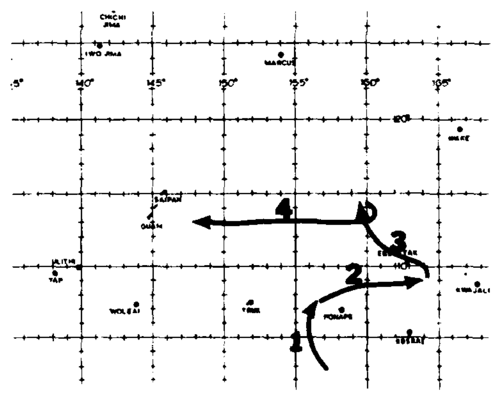


Figure 3-03-2. Typhoon Odessa's best track illustrating the four segments of Odessa's track as discussed in the text.

Odessa's initial movement to the northwest was in response to a weakening of the subtropical ridge northeast of Guam and the rapid cyclogenesis which was occurring southeast of Japan. The first three forecasts described a short-term northwestward movement followed by a more pronounced westward track. However, the continued deterioration of the subtropical ridge, north of Odessa, essentially removed any easterly steering current capable of driving Odessa westward. During the same period, a major high pressure system moved southeastward from Japan and strengthened the low-level northeasterly wind regime west of Odessa. Conventional surface data, at 300000Z, show this ridging extended deep into the tropics and created an effective block to any continued northwestward advance by Odessa (Figure 3-03-3). At mid-tropospheric levels, rawinsonde data from Truk (WMO 91334), Ponape (WMO 91348) and Kwajalein (WMO 91366) indicated that the base of a mid-latitude trough extended well into the tropics and south of Odessa. Although the axis of this trough was located well northeast of Odessa, between 160E and 165E (500 mb), its influence on Odessa's movement became obvious in the days that followed.

On 30 and 31 March, as Odessa tracked eastward at 10 to 11 kt (19 to 20 km/hr), the mid-latitude trough advanced more rapidly eastward and was located near 170E at 310000Z. Odessa, now 400 nm (741 km) west of the trough axis, began to slow and eventually turn toward the north. As Odessa approached 10N, it turned west-northwestward in response to a weak subtropical ridge filling in behind the mid-latitude trough

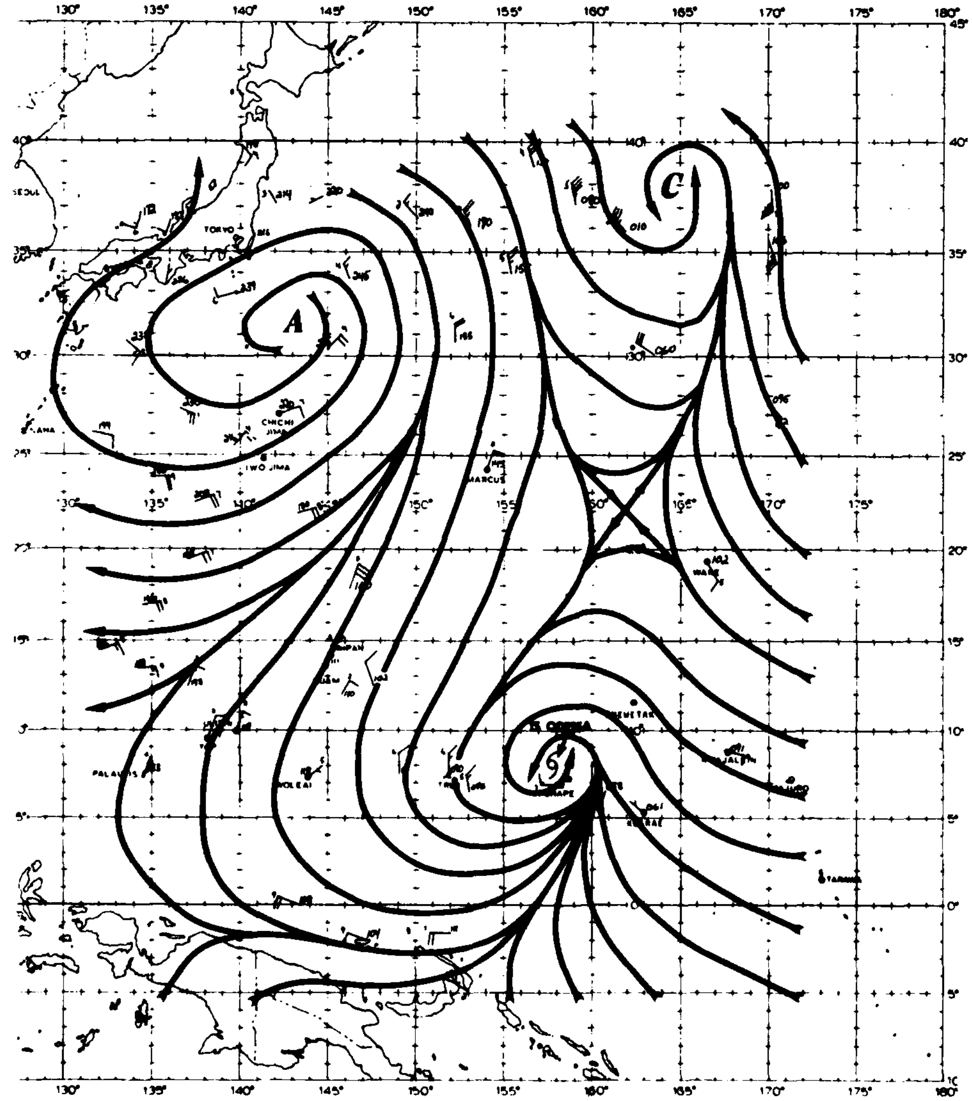


Figure 3-03-3. The 300000Z March 1982 surface/gradient level wind data and streamline analysis. Wind speeds are in knots.

(which had stalled near 175E). To this point, Odessa had maintained an intensity near 50 kt (26 m/sec) as westerlies restricted the development of the cyclone's circulation. With the subtropical ridge in place, Odessa was able to develop a closed circulation in the mid-tropospheric levels and a noticeable intensification trend began which culminated with a peak intensity of 75 kt (39 m/sec) at 030000Z (Figure 3-03-4 shows Odessa just prior to reaching typhoon strength).

Just as Odessa reached maximum intensity, the last major directional change commenced. On 3 April, Odessa was approaching a break in the subtropical ridge, along 158E. Forecasts described a track northward around the ridge axis and then northeastward toward Wake Island. However, strong mid- and upper-level southerly winds moved over Odessa and a rapid shearing of the major convective features to the northeast followed. At 030800Z, a reconnaissance aircraft located Odessa's low-level circulation center 90 nm (167 km) southwest of the closest convective activity. During the 24 hours that followed, Odessa weakened rapidly and was no longer detectable from satellite imagery after 040600Z.

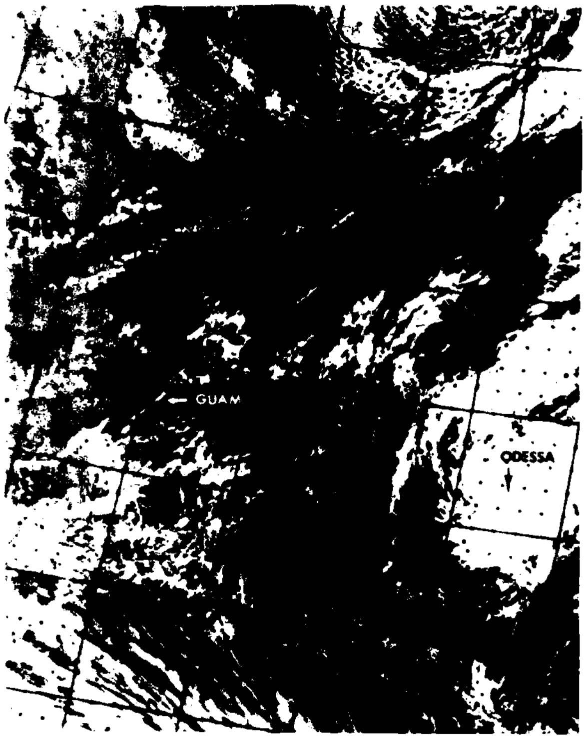
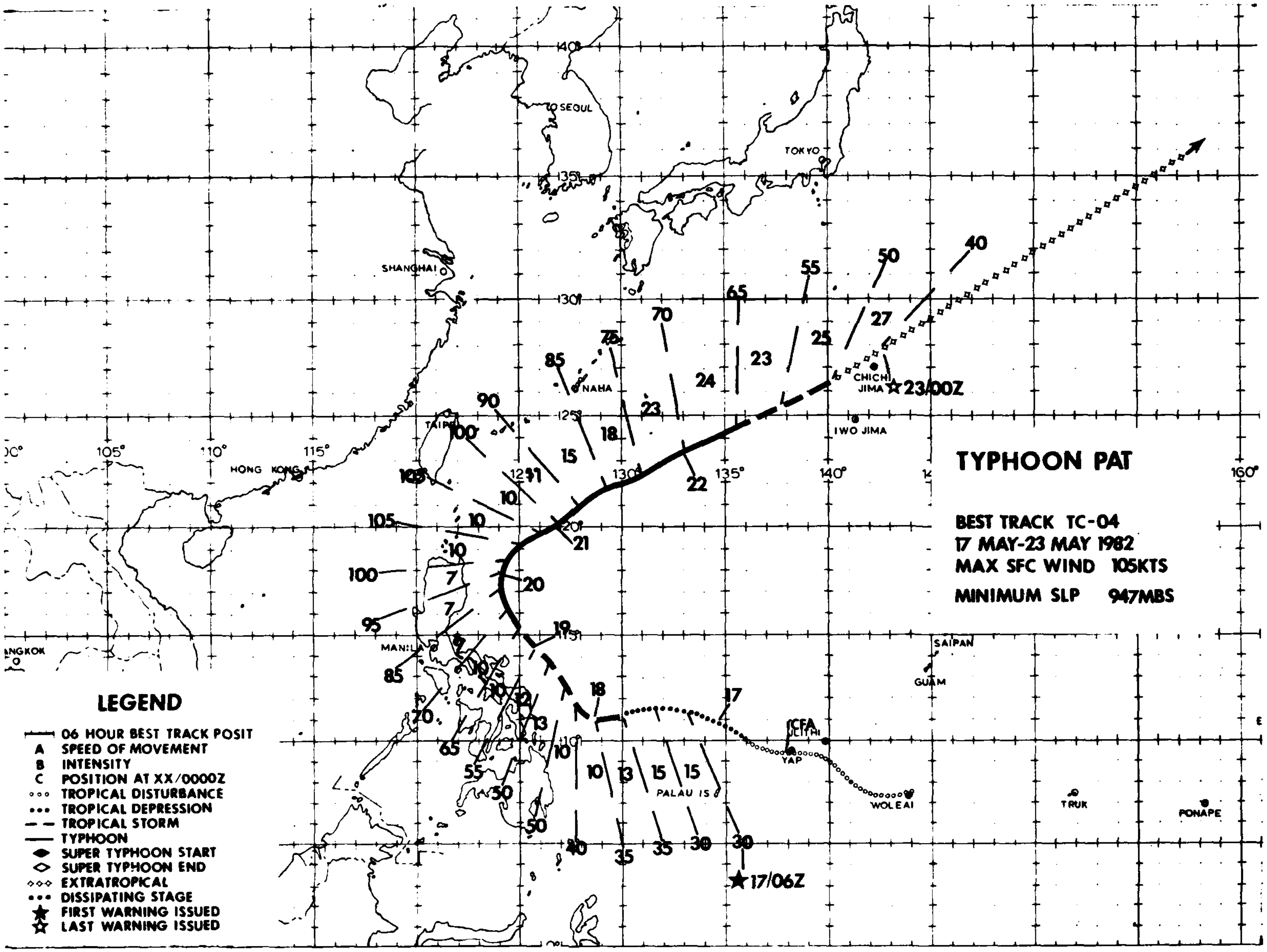


Figure 3-03-4. Tropical Storm Odessa, approximately 18 hours prior to reaching maximum intensity. At this time, Odessa was approximately 90 nm (167 km) west of Enewetak Atoll with maximum winds of 60 kt (31 m/sec). Note the cirrus streamers to the south, these originated from TC 17-82 (Bernie) in the Southern Hemisphere. Later, near 030000Z, Bernie's expansive development would increase the southerly winds moving toward Odessa and aid in the shearing process which led to Odessa's dissipation. 020425Z April (NOAA 7 visual imagery).


TYPHOON PAT
BEST TRACK TC-04
17 MAY-23 MAY 1982
MAX SFC WIND 105KTS
MINIMUM SLP 947MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
23/00Z
17/06Z
SEOUL
TOKYO
SHANGHAI
HONG KONG
NAHA
CHICHI JIMA
IWO JIMA
MANILA
SAIPAN
GUAM
YAP
WOLEAI
TRUK
PONAPE
PALAU IS
105°
110°
115°
135°
140°
160°

The transition from the winter to the summer monsoon regime over the tropical western North Pacific can vary greatly from year to year. During this transition time (March through May), tropical cyclone activity can be very strong (six in 1980) or moderate (three in 1981). In May, 1982, there were several disturbances that developed in the near-equatorial trough and then dissipated without producing a significant tropical cyclone. During the third week of May, Typhoon Pat developed and became the only disturbance to reach warning status in the region between early April (Typhoon Odessa (03)) and late June (Typhoon Ruby (05)).

The disturbance that eventually produced Typhoon Pat was first detected as a mid-level circulation southwest of Guam. The 140000Z May 500 mb streamline analysis depicted a cyclonic circulation center near 8N 143E. Coincident with the analysis, satellite imagery indicated an area of centralized convection associated with the circulation. A Tropical Cyclone Formation Alert (TCFA) was issued at 140305Z when evidence of a strong upper-level circulation center was noticed on satellite imagery. Aircraft reconnaissance at 140600Z reported no evidence of a surface circulation but did observe an area of strong low-level convergence near the convective disturbance.

It wasn't until the disturbance began moving out of the near-equatorial trough that a low-level circulation could be located by reconnaissance aircraft. On 17 May, another aircraft investigation located a closed circulation at 1500 ft (472 m) but surface winds were too light to determine a surface circulation center. The first warning on Pat, as Tropical Depression 04, was issued at 170600Z when sustained increased convective organization was observed on satellite imagery.

The forecast movement for the first six warnings projected Pat to move westward with passage over the Philippines, south of Luzon. This scenario was based on the existence of a mid-level (500 mb) ridge centered over the western portion of the South China Sea which was forecast to build eastward thus blocking northward movement of Typhoon Pat. During the ensuing 24-hour period, little change was evident in the mid-level ridge north and northwest of Pat (Figure 3-04-1). The

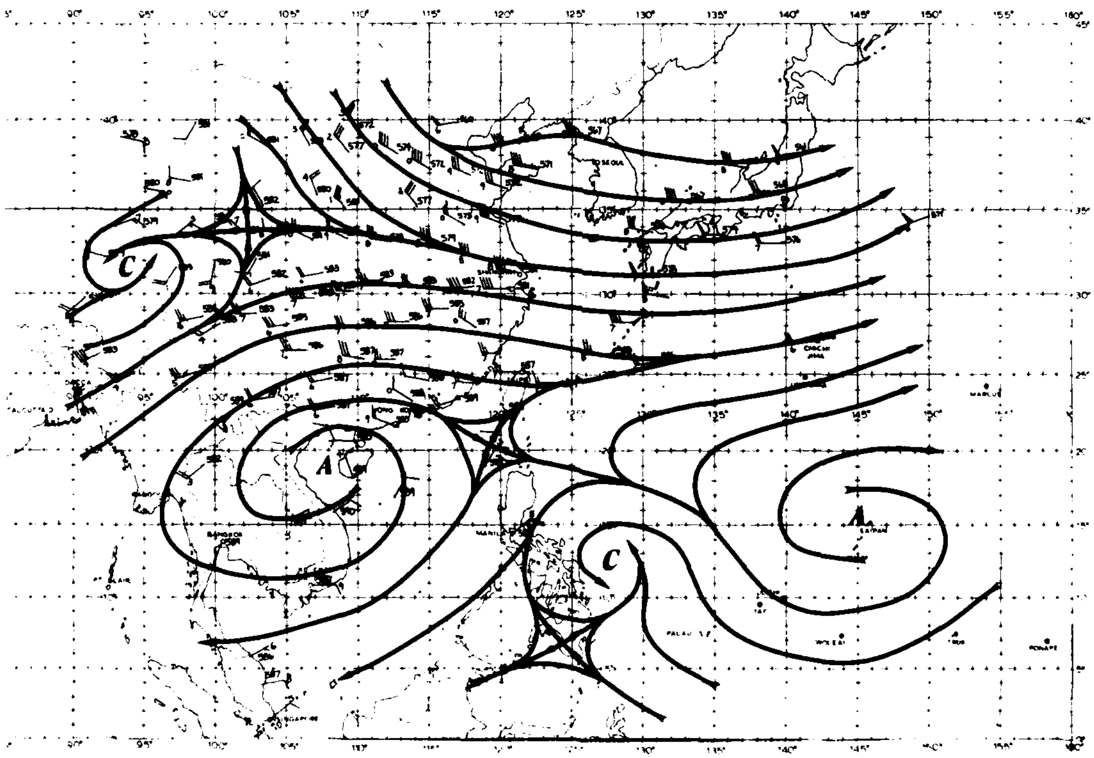


Figure 3-04-1. 500 mb streamline analysis at 181200Z May which shows Pat just south of an apparent weakness in the subtropical ridge. There had been no appreciable height-fall changes over a 24-hour period when Pat suddenly changed from a westward-moving to northward-moving tropical cyclone.

expected building of the ridge had not materialized; yet until 18 May, Pat persisted on its westward track. Then abruptly at 180600Z, Pat turned northward and paralleled the eastern portion of the Philippines for two days. Aircraft reconnaissance data at 180940Z provided the first indication of a possible track change, which was later confirmed by satellite fixes from Detachment 1, 1WW, Nimitz Hill, Guam and radar fixes from Catanduanes Island (WMO 98447). At 190000Z, upon evaluation of the fix data and a reevaluation of the westward track forecast scenario, JTWC changed the forecast track northward and toward eventual recurvature. From that point forward, Pat presented no further track forecasting problems.

Shortly after turning northward, Pat began to rapidly intensify, aided by a 200 mb wind maximum that had moved north of Pat and had enhanced outflow channels to the northeast. At 211200Z, Typhoon Pat reached its maximum intensity of 105 kt (54 m/sec) (Figure 3-04-2). This rapid intensification was not fully anticipated as Pat was forecast to only attain minimal typhoon strength. When aircraft reconnaissance data at 192233Z reported 95 kt (49 m/sec) surface winds, this new information was factored into the next forecast which then called for Pat to attain maximum intensity within the ensuing 12 to 18 hours. Fortunately, Pat's increased intensity did not bring any destructive winds to the Philippines, previously hit by Tropical Storm Mamie (01) and Typhoon Nelson (02), despite approaches as close as 90 nm (167 km) to Catanduanes Island and eastern Luzon.

As Typhoon Pat approached 20N, a track toward the northeast became increasingly favorable. In recurvature, Pat began to accelerate in response to increasing mid- and upper-level westerly steering currents. A new method for forecasting the acceleration of northward-moving tropical cyclones, developed by JTWC personnel during the past year, was used to predict the point of initial acceleration as well as the rate of acceleration; Typhoon Acceleration Prediction Technique (TAPT) (Weir, 1982), utilizes 200 mb analysis data to determine possible future acceleration. First used on the 191200Z analysis data, TAPT accurately predicted acceleration to begin near 19N and gave excellent guidance on the speed of movement to 24N, where Pat slowed its forward speed and weakened from the effects of vertical wind shear on the system's organization.

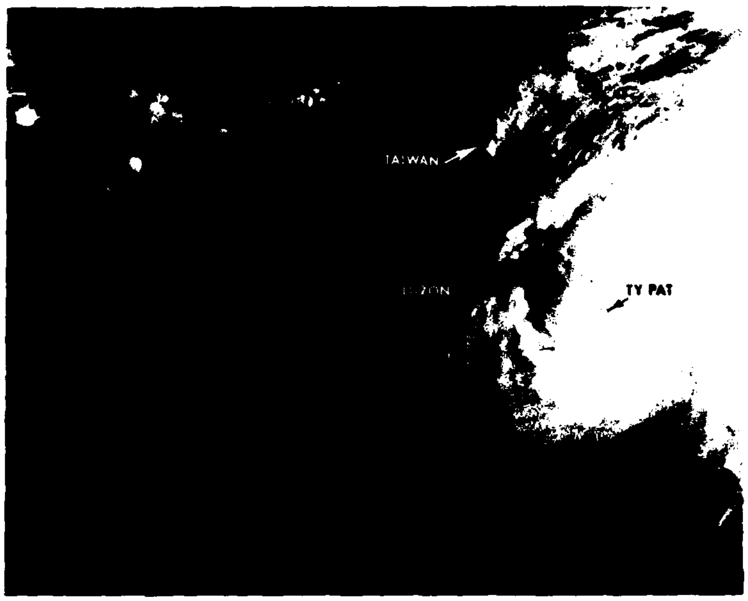
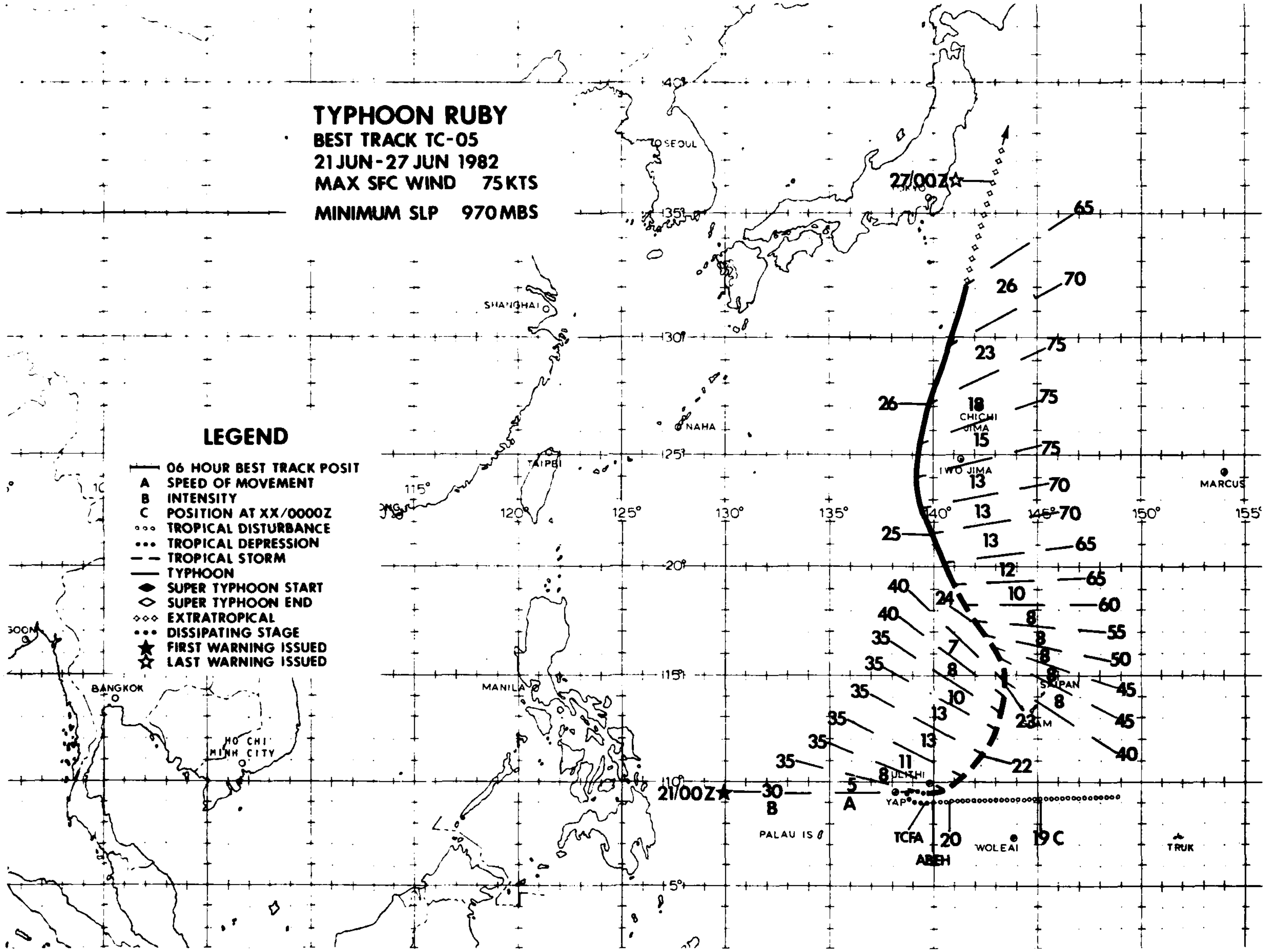


Figure 3-04-2. Typhoon Pat near maximum intensity of 105 kt (54 m/sec), 150 nm (278 km) east of Luzon, 200641Z May (NOAA 7 visual imagery).

On 22 May, as Typhoon Pat approached 24N, a weak frontal system (associated with an extratropical low east of Japan) was moving toward Pat and the first indications of Pat's eventual transition to an extra-tropical low were observed. Since 211600Z, there had been a marked decrease in Pat's deep-layer convection; additionally, aircraft reconnaissance data at 220955Z indicated that the central sea level pressure had risen to 988 mb. Although observed winds were still near typhoon strength, the maximum winds were observed at distances much further from the center than in previous missions. These expanding wind radii are frequently associated with tropical cyclones undergoing extratropical transition as the cyclone's energy source changes from latent heat release to a more baroclinic process. By 221200Z, synoptic data gave evidence of the incursion of cool, dry air into Pat's center and satellite imagery showed the system merging into a weak frontal boundary. Transition to an extratropical low was completed by 230000Z and this low gradually dissipated during the subsequent 24 hours as it was drawn into a stronger extratropical system, east of Japan.


TYPHOON RUBY
BEST TRACK TC-05
21 JUN-27 JUN 1982
MAX SFC WIND 75 KTS
MINIMUM SLP 970 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
SHANGHAI
NAHA
TAIPEI
MANILA
BANGKOK
HO CHI MINH CITY
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
TCFA
ABEH
27/00Z
21/00Z
115°
120°
125°
130°
135°
140°
145°
150°
155°
40°
35°
30°
25°
20°
15°
10°
5°

Typhoon Ruby developed from a convective disturbance which was initially detected southeast of Guam on 18 June. During the first ten days of Ruby's development, its track and eventual extratropical transition were dramatically affected by several events which can be traced to fairly rapid changes in the upper-troposphere. These events will be discussed individually as they occurred during Ruby's lifespan; however, collectively, they illustrate the need for a better understanding of the upper-troposphere and its effects on subsequent tropical cyclone development and movement.

Satellite imagery, on 18 June, located a weak convective disturbance 320 nm (593 km) southeast of Guam. During the next 24 hours, this disturbance was observed tracking westward to near 145E where it weakened significantly while an upper-level anticyclone, previously supporting the convection, receded to a position east of 150E. On 20 June, a cloud cluster developed near 9N 141E and continued moving westward, south of Ulithi Atoll (WMO 91203). A Tropical Cyclone Formation Alert was issued upon receipt of Ulithi's 200600Z surface observation which reported a six-hour pressure fall

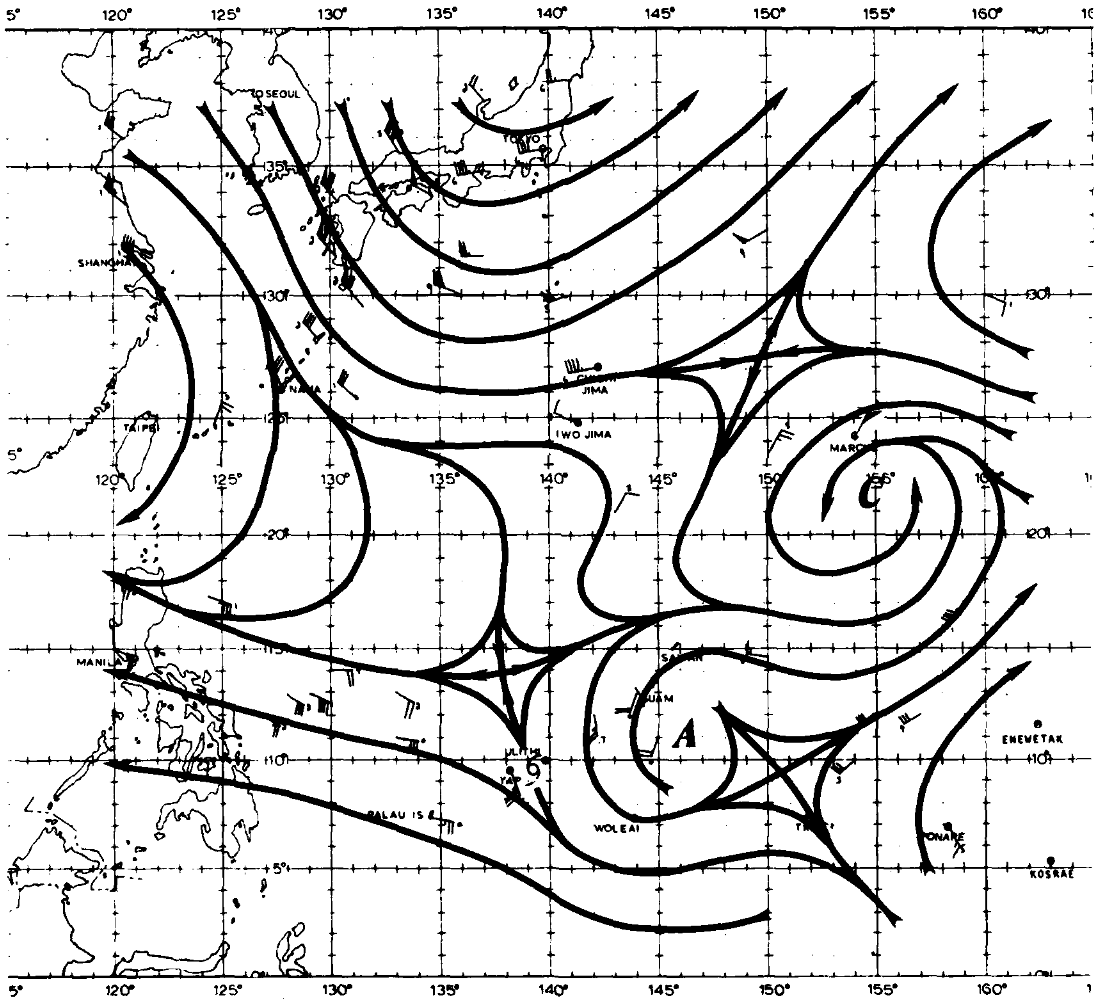


Figure 3-05-1. 210000Z June 1982, 200 mb streamline analysis. Ruby, positioned within a divergent southerly flow, was maintaining a central convective feature. To the north, a broad northerly flow was beginning to influence the near-storm environment. Wind speeds are in knots.

of 5 mb to 1004 mb, and a windshift from 030 degrees at 20 kt (10 m/sec) to 100 degrees at 25 kt (13 m/sec).

During the next 42 hours, satellite imagery and synoptic data indicated very little westward movement, with the system moving erratically between Yap and Ulithi. At 202339Z, the first aircraft reconnaissance mission into the system located a well-defined, very compact, 995 mb circulation center 45 nm (83 km) west-southwest of Ulithi. Based on these data, the first warning was issued for Tropical Storm Ruby at 21000[illegible] with a forecast track toward the west-northwest. This forecast track was based on a very close agreement in most objective forecast aids. In fact, only the 700 mb and 850 mb steering aids, which indicated south-eastward low-level steering, did not support this initial forecast movement.

The apparent conflict between low-level and mid-level steering was seen as a reason for Ruby's erratic movement; but at that point, the long-term potential for a west-northwestward track looked good. At 210830Z, an aircraft fix located Ruby 35 nm (65 km) south of Ulithi; this fix was in good agreement with Ulithi's 210600Z observation. Unfortunately, the 210600Z observation would be the last received from Ulithi for 24 hours. During the next 18 hours, fix positions from infrared satellite imagery showed Ruby moving northward, then northwestward, passing over Ulithi. Without sufficient synoptic data to the contrary, the next few warnings followed these satellite positions and maintained the forecast track toward the west-northwest.

However, on this first day in warning status, the upper-level wind regime near Ruby was changing. As depicted in Figure 3-05-1,

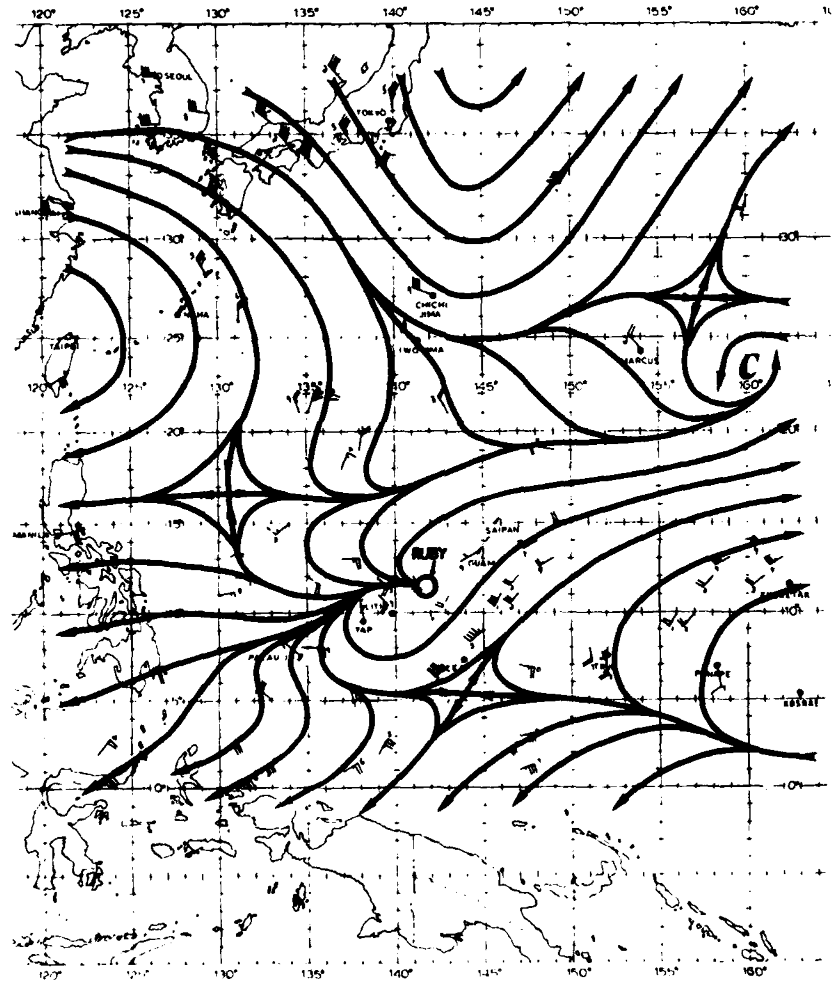


Figure 3-05-2. 220000Z June 1982, 200 mb streamline analysis. Considerable change has occurred in a 24-hour period. The northerly winds have penetrated to 10N, where the base of an upper-level trough formed. Coincident with this trough, a maximum cloud zone developed over the area south of Ruby's position and near-gale force winds were observed over a broad area at the surface and gradient levels near the upper-level trough/maximum cloud zone. Wind speeds are in knots.

the 200 mb winds at 210000Z were strongly divergent over Ruby but a broad mid-latitude trough, south of Japan, was introducing a significant northerly flow into the region. By 220000Z, the 200 mb winds (see Figure 3-05-2) had changed and an upper-level trough had set up south of 10N, and south of Ruby. While this process was underway, the objective forecast aids - especially the tropical cyclone models - were predicting a return to a westward track while analyses data were indicating a strengthening of the monsoon flow, located southeast and southwest of Ruby. When the first visual satellite imagery became available on 22 July, a low-level circulation center was seen embedded in a maximum cloud zone which had developed over the monsoon flow. This circulation, presumed to be Ruby, was located near 11N 142E, or more than 200 nm (370 km) from the 210000Z warning position. The 220000Z warning was immediately amended and a forecast track to the northeast, toward Guam, was issued. Interestingly, this amended warning had an exact 24-hour forecast position and only a 57 nm (106 km) error at 48-hours; but more importantly, a similar set of forecast errors could have been produced as early as 210600Z if the development of an upper-level trough and associated surge in the southwest monsoon could have been predicted from the 210000Z upper-wind flow analysis. This northeastward movement has become a familiar pattern in years past when developing tropical cyclones become involved with an intensifying southwest monsoon. For recent examples, refer to past ATCRs describing Tropical Depression 16/Typhoon Orchid (1980), Tropical Storm Thelma/Typhoon Vernon (1980), Tropical Depression 11/Tropical Storm Phyllis (1981), and Typhoon Gay (1981).

As Ruby moved northeastward toward Guam, its intensity remained near 35 kt (18 m/sec). During this period, much of Ruby's circulation pattern was involved with the monsoonal flow and the strongest winds were observed within the maximum cloud zone associated with this flow. Not until 23 June, when Ruby turned northward and became a separate entity from this maximum cloud zone, did its surface pressures fall and intensity increase.

Although the best track might suggest a rather steady increase in both Ruby's intensity and speed of movement from 23 through 25 June, these days were marked by often conflicting fix data. For example, the 240445Z visual satellite imagery (refer to Figure 3-05-3) indicated an exposed low-level circulation center near 19N 142E, while a

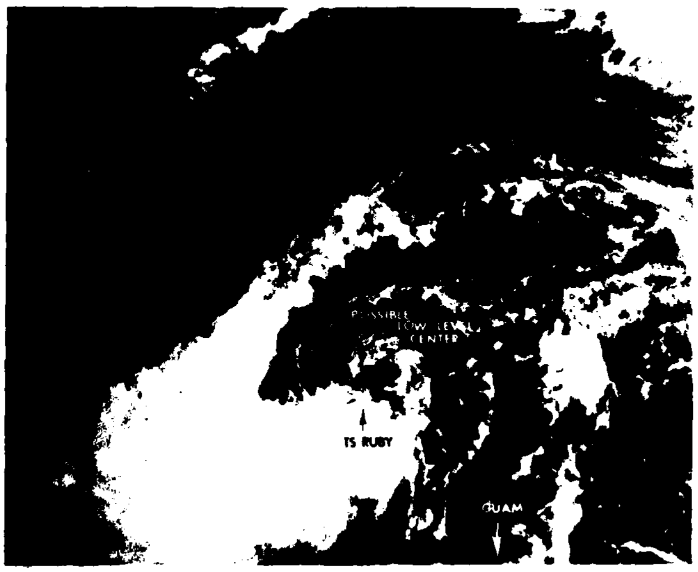


Figure 3-05-3. Visual satellite imagery suggested a low-level circulation center located in the northern periphery of the cloud system. This apparent low-level center was located well-north of a aircraft position received more than 3 hours later. 240445Z June 1982 (NOAA 7 visual satellite imagery).

reconnaissance aircraft surface/700 mb fix, at 240809Z, found a center nearly 60 nm (111 km) to the south. On 25 June, the 250630Z and 250911Z 700 mb aircraft fixes were positioned in a way to suggest either erratic movement or multiple circulation centers. These phenomena have been observed in other tropical cyclones which have emerged from an active monsoon flow. Typhoon Orchid (1980) had a sufficient amount of satellite, aircraft and radar fixes to suggest a high speed looping pattern over a 30-hour period. Ruby's intensity during this period was equally hard to determine. Intensity estimates derived from visual satellite imagery (Dvorak, 1973) and minimum sea level pressures (Atkinson and Holliday, 1977) were normally separated by 15 to 25 kt (8 to 13 m/sec), with the pressure consistently lower than expected during this period. In post-analysis, both the track and the intensity trend have been smoothed by a careful reevaluation of the data during this period.

As Ruby moved north-northwestward, the potential for recurvature, significant acceleration and extratropical transition became increasingly important. Based on a series of evaluations from the 240000Z, 241200Z and 250000Z 200 mb charts, 24N was consistently identified as the best latitude for initial acceleration into the mid-latitude westerlies (Typhoon Acceleration Prediction Technique (Weir, 1982)). A persistent and strong west-southwesterly 200 mb flow over Japan gave an indication for the potential of recurvature toward the northeast and, based on the mean latitudes of recent mid-latitude low pressure systems and ocean sea surface temperature fronts, 35N was deemed to be a favorable latitude for extratropical transition. Figure 3-05-4 depicts the 251200Z 200 mb flow with Typhoon Ruby near 24N. Within 18 hours, Ruby had assumed a north-northeastward track and accelerated to 23 kt (43 km/hr). The 260000Z 200 mb analysis (Figure 3-05-5)

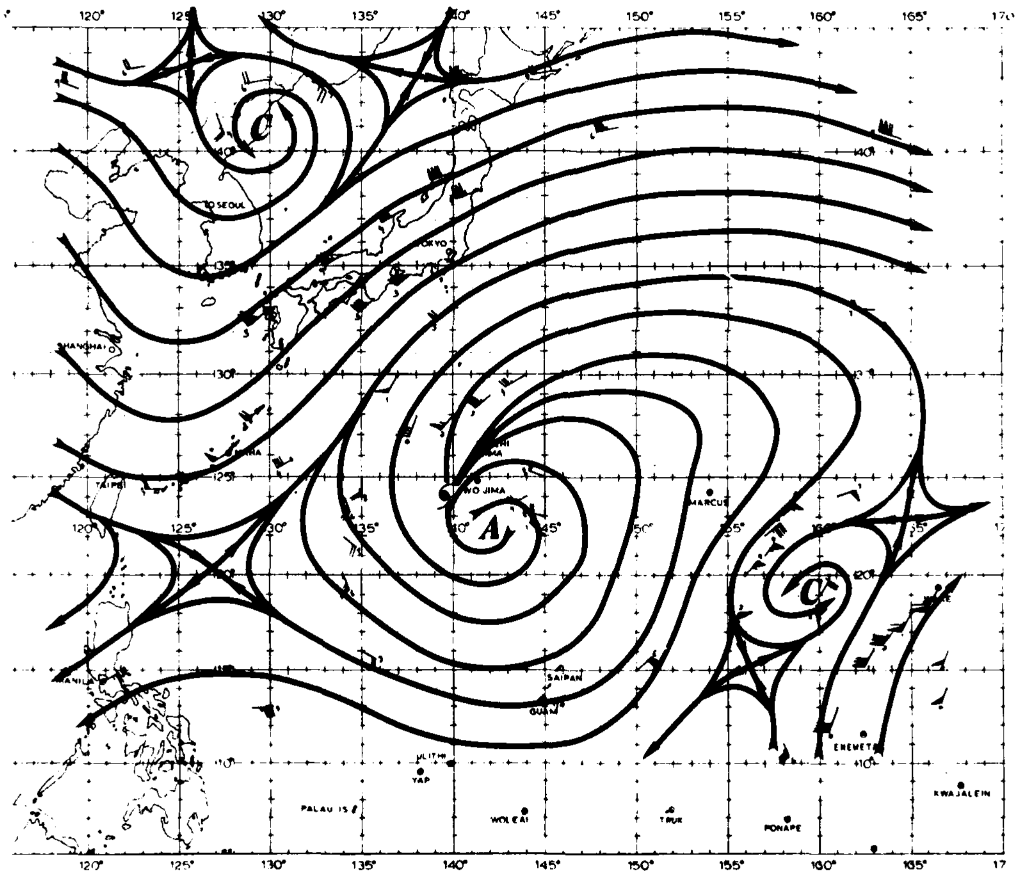


Figure 3-05-4. 251200Z June 1982, 200 mb streamline analysis. Typhoon Ruby was becoming involved with the upper-level mid-latitude westerlies. Wind speeds are in knots.

showed a dramatic change in the upper-wind pattern over Japan; 200 mb winds had become south-southeasterly and thus, signalled the potential for a more northward track. However, visual satellite fixes indicated a continuing tendency toward the northeast and the northeast forecast track was maintained. The 260602Z reconnaissance aircraft fix located Ruby's low-level circulation center 70 nm (130 km) west of the 260600Z warning position and these data, along with the 200 mb winds, dictated an amended warning toward the north-northeast and passing just east of northern Honshu.

A similar shift in the 200 mb flow also occurred with Typhoon Thad (August, 1981) and as Ruby approached the mid-latitude westerlies, the potential for such a shift was being closely monitored. Unlike Thad, Ruby quickly transitioned to an extratropical low and this movement and upper-wind shift may have been associated with that process more than any large-scale changes in the upper-troposphere.

The final tropical cyclone warning for Ruby was issued at 270000Z, after the 262149Z aircraft fix data indicated a cold core low was present at 700 mb. As an extratropical low, Ruby continued to move toward the north and rapidly occluded, becoming nearly stationary east of Hokkaido for several days thereafter.

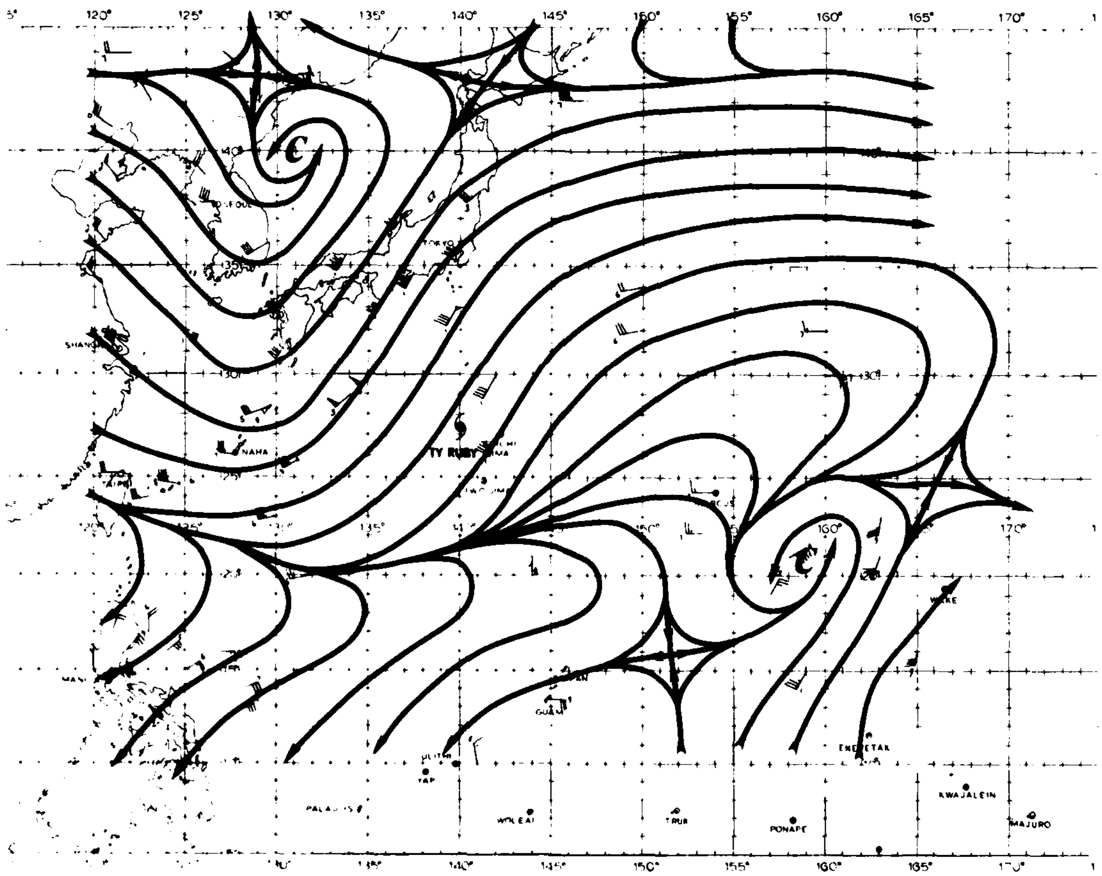
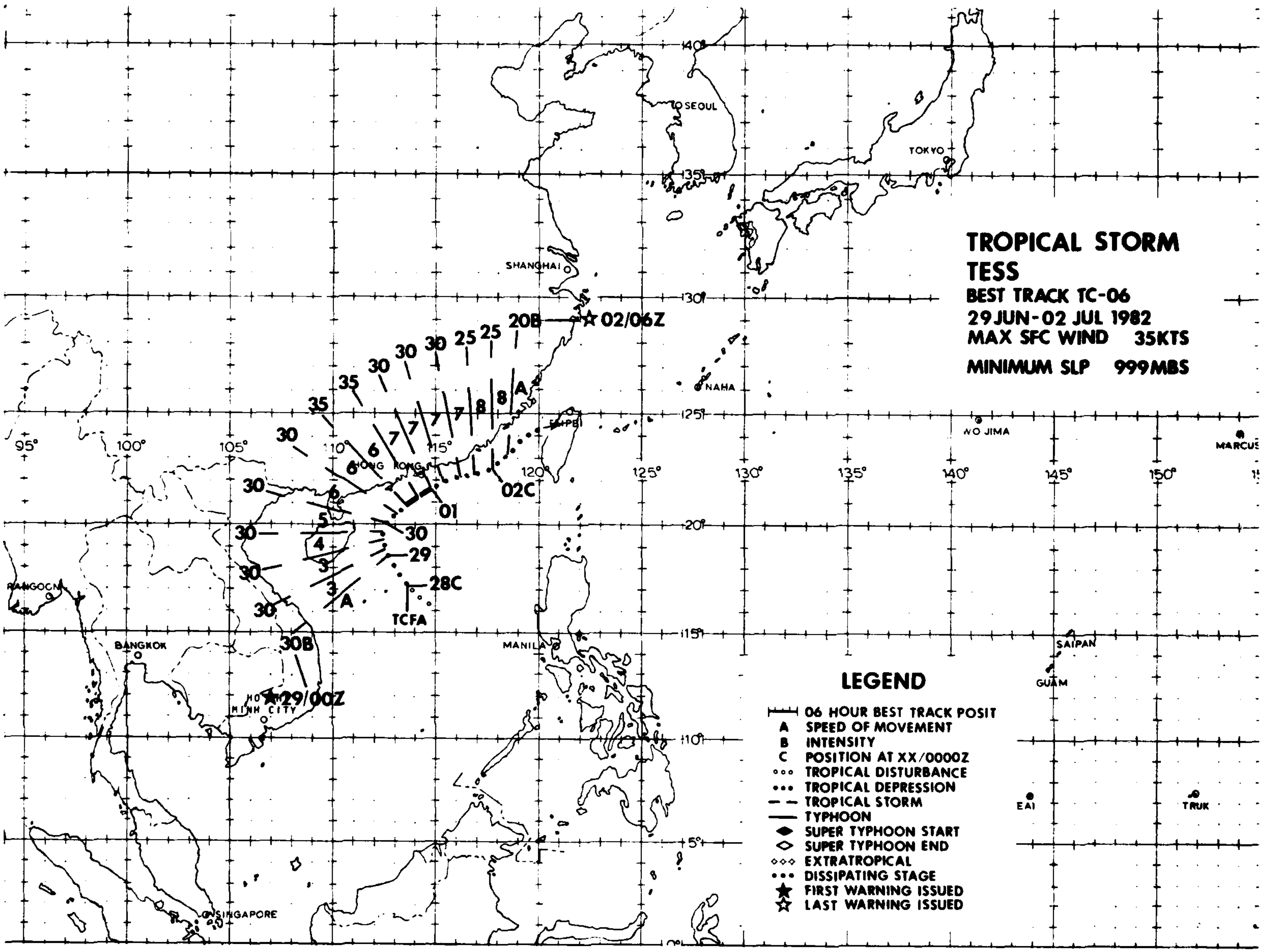


Figure 3-05-5. 260000Z June 1982, streamline analysis. Typhoon Ruby was well-embedded in the mid-latitude flow. Note the significant change in the 200 mb wind pattern over Japan in just 12 hours. This change, along with Ruby's rapid extratropical transition produced an extended north-northeastward movement and not the north-eastward track predicted earlier from the 200 mb flow depicted in Figure 3-05-4. Wind speeds are in knots.


TROPICAL STORM
TESS
BEST TRACK TC-06
29 JUN-02 JUL 1982
MAX SFC WIND 35KTS
MINIMUM SLP 999MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
02/06Z
29/00Z
20B
30B
28C
02C
01
TCFA
SHANGHAI
SEOUL
TOKYO
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
RANGOON
SINGAPORE
HO CHI MINH CITY
IWO JIMA
MARCUS
SAIPAN
GUAM
EAI
TRUK
95°
100°
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°

The Tropical Storm Tess had its origins and much of its life cycle linked to a strong southwest monsoonal flow which was established over the South China Sea in late June. While low surface pressures and gale force winds generally prevailed over a majority of the region, a disturbance could not be detected until 27 June, when synoptic reports indicated the development of a weak low-level circulation. At the point of initial detection, the nearest area of significant convection was located more than 200 nm (370 km) to the northwest of the circulation. A Tropical Cyclone Formation Alert was issued at 272330Z when it had become apparent that a zone of lower surface pressures (< 1002 mb) was aligning itself in close proximity to the disturbance.

During the subsequent 24-hour period, there was an increase in convective activity within the formation alert area and satellite imagery suggested an increase in convective organization. Although still lacking evidence of vertical alignment, the trends toward lower surface pressures and increased convection prompted the issuance of the initial warning for Tropical Depression 06 at 290000Z.

From 28 to 30 June, Tropical Depression 06 tracked northward without any further evidence of convective organization. On 30 June, the depression turned east-northeastward and paralleled the coast of China. During this period, the southwest monsoon had abated somewhat and several weak circulations (eddies) became evident on satellite imagery (Figure 3-06-1). However, as the system passed south of Hong Kong, synoptic reports indicated that near-gale and gale force winds were present close to Tropical Depression 06. Thus, on the 010000Z July warning, Tropical Depression 06 was upgraded to Tropical Storm Tess. Post-analysis of this period indicates that Tess probably only attained tropical storm strength for a relatively short period (301200Z to 301800Z).

On 1 and 2 July, surface synoptic data indicated a marked decrease in wind velocities in the area and thereafter, the remants of Tess gradually dissipated as it approached the Formosa Strait.

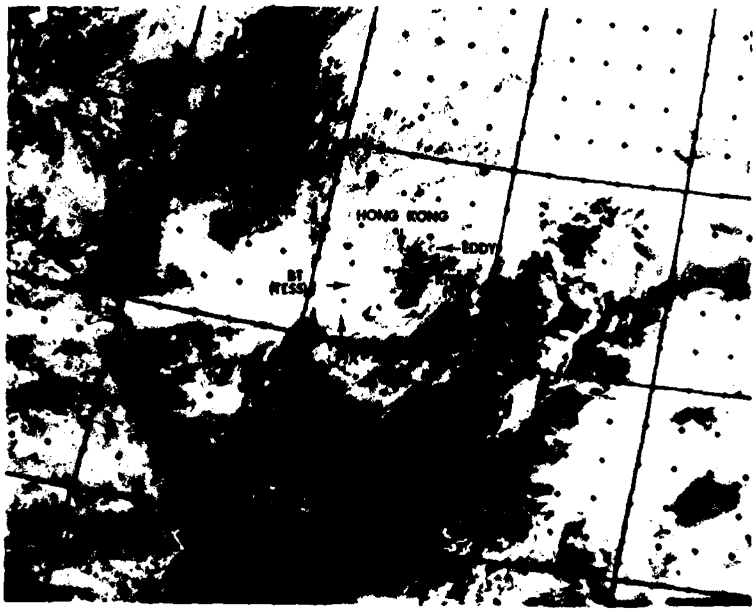
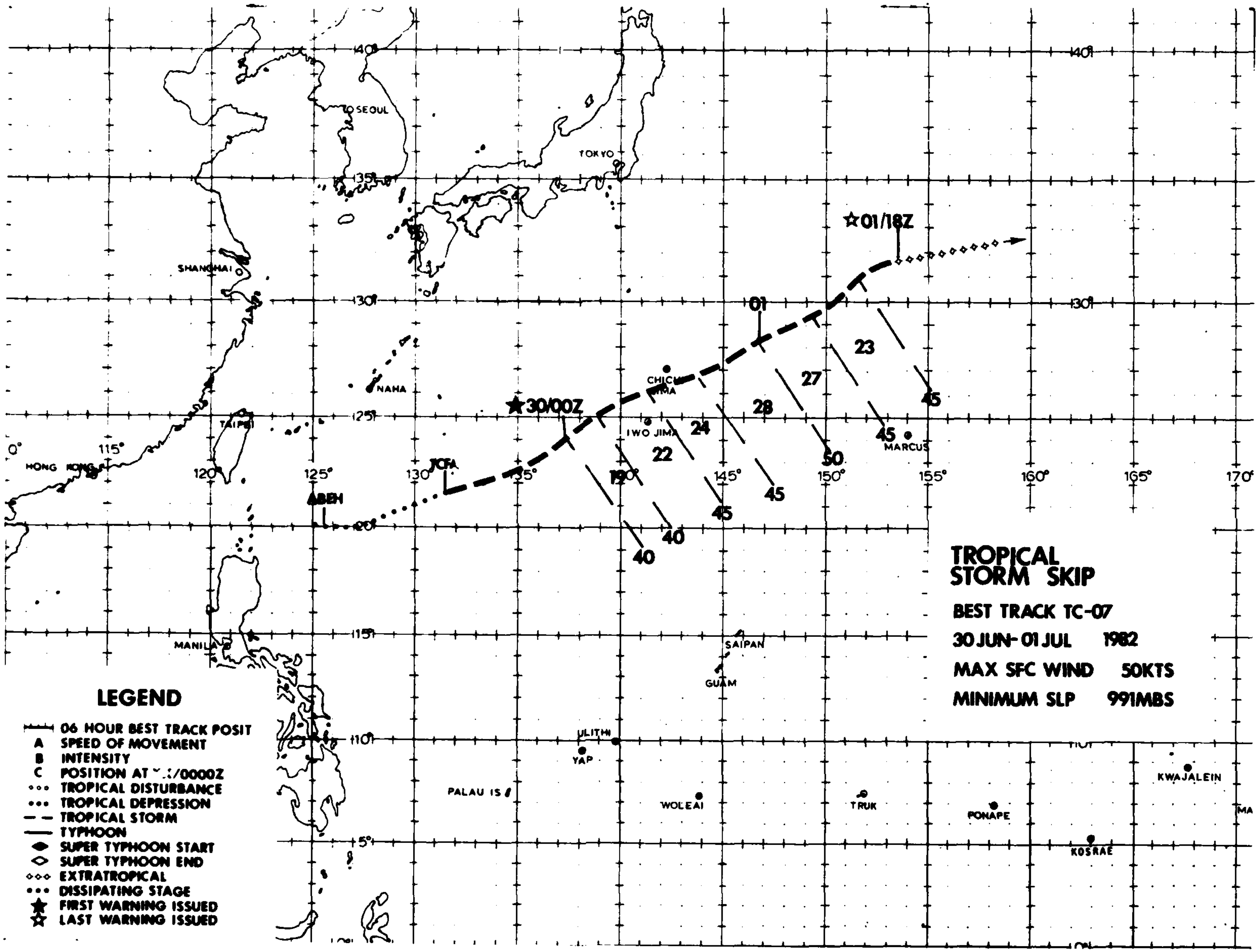
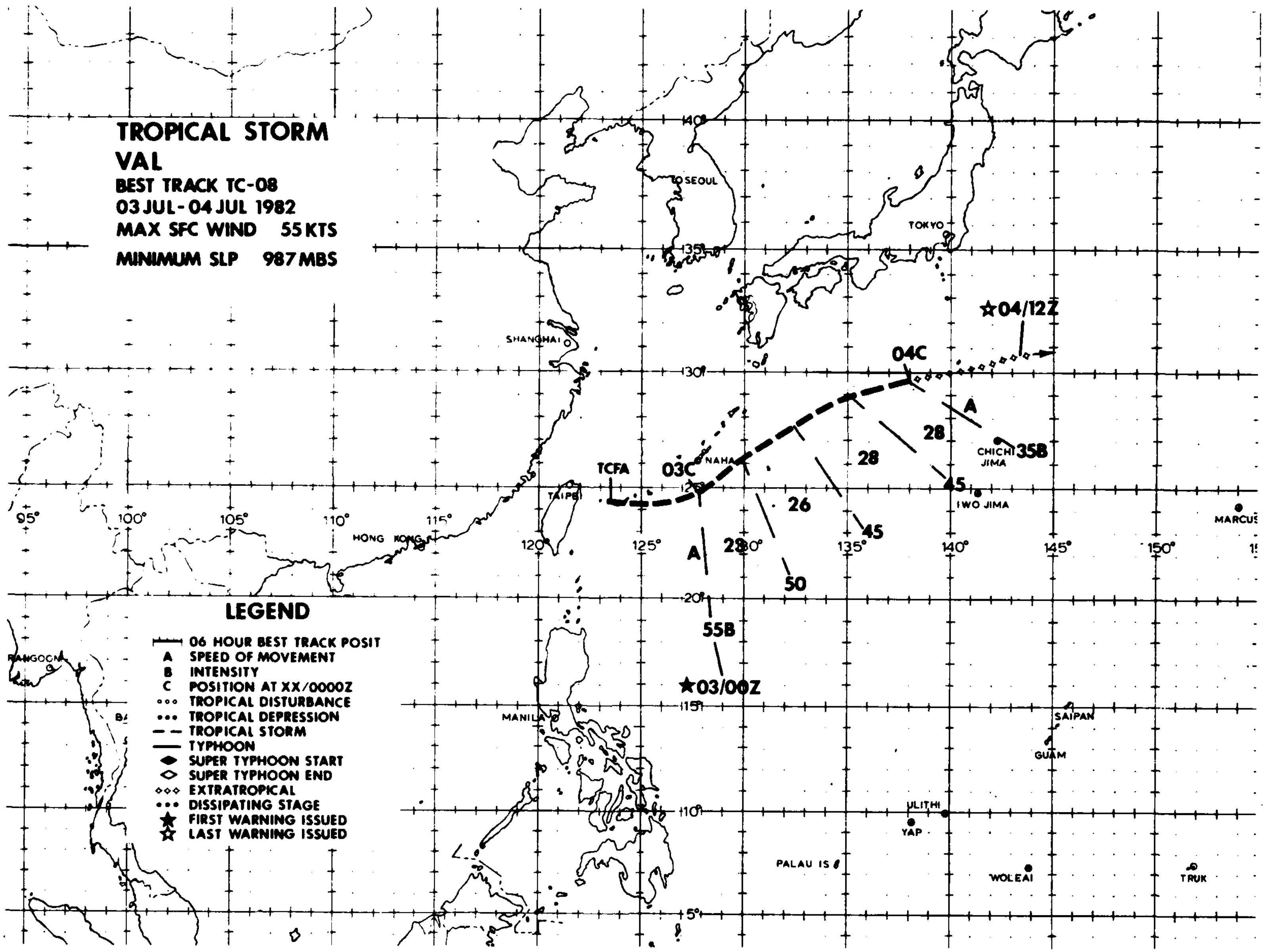


Figure 3-06-1. Satellite imagery shows several low-level eddies far removed from the central convective mass. Fix positions supplied from Detachment 5, 1WW, Clark AB, RP (RPMK) and from Detachment 1, 1WW, Nimitz Hill, Guam (PGTW) differ considerably in determining which eddy is the developing Tropical Storm Tess. The final best track position at fix time is shown as BT. 300656Z June (NOAA 7 visual imagery)


TROPICAL STORM SKIP
BEST TRACK TC-07
30 JUN-01 JUL 1982
MAX SFC WIND 50KTS
MINIMUM SLP 991MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT ../0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
01/18Z
30/00Z
01
ABEH
JCFA
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
KWAJALEIN


TROPICAL STORM
VAL
BEST TRACK TC-08
03 JUL-04 JUL 1982
MAX SFC WIND 55 KTS
MINIMUM SLP 987 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
04/12Z
04C
03C
TCFA
03/00Z
55B
35B
28
26
45
50
A
SEOUL
TOKYO
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
95°
100°
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°

TROPICAL STORMS SKIP (7) AND VAL (8)

Each tropical cyclone season sees a few circulations devèlop near the mid-latitudes which appear to have both tropical and extratropical characteristics. These "hybrid" or "subtropical" cyclones have long been known to the tropical forecaster. In particular, an article by Herbert and Poteat (1975) describes several distinguishing characteristics that allow differentiation between tropical and subtropical systems based upon satellite imagery (Table 3-07-1). The week between 23 June and 5 July saw two such circulations, Tropical Storms Skip and Val, develop southeast of Taiwan. During their existence each of these relatively small and compact systems were observed to have several characteristics associated with non-tropical cyclones, e.g. very little deep-layer convection near the surface center, displacement of convective features poleward and eastward of the system center, and each remained entirely enveloped within a larger cloud system associated with the mid-latitude westerlies. Conversely, both aircraft and satellite reconnaissance data indicated some typical tropical characteristics, i.e. a sharp pressure gradient near the center, surface winds in excess of 45 kt (23 m/sec), warm central temperatures, and a small but uniquely tropical upper-level anticyclonic outflow pattern.

The origin of the first circulation, Tropical Storm Skip, was more tropical in nature. The disturbance was first detected near 20N 124E on 26 June when surface synoptic data indicated the presence of a circulation that was subsequently apparent as an exposed low-level circulation on satellite imagery. Synoptically, a sharp trough existed between this area and Typhoon Ruby (05), which was in its initial phases of extratropical transition near 30N 130E. Although satellite imagery indicated that frontogenesis had begun, it is unclear from the available data just how far south along the trough the front could be identified. To the west, an active monsoon trough, which was soon to spawn Tropical Storm Tess (06) in the South China Sea, had also begun to push into the area. During the next three days, winds in excess of 15 to 20 kt (8 to 10 m/sec) could be detected in the monsoon flow south of the circulation; however, very little organized convection could be detected near the vortex. In the upper-troposphere, westerlies penetrated as far south as 25N (at 500 mb) and 20N (at 200 mb) as the result of deep troughing behind the now extratropical Ruby. By 29 June the 200 mb flow began to ridge strongly along the trough boundary and 60 to 70 kt (31 to 36 m/sec) westerly winds to the north were soon accompanied by 65 kt (33 m/sec) northeasterly winds south of the trough. This resulted in an extensive cloud band more than 500 nm (926 km) wide along this entire region. A Tropical Cyclone Formation Alert (TCFA) was issued at 290500Z when a small upper-level anticyclone appeared to be developing in the vicinity of the low-level circulation (Figure 3-07-1).

TABLE 3-07-1. SUBTROPICAL AND TROPICAL CYCLONES

A. DETERMINING TYPE

	SUBTROPICAL	TROPICAL
1. Main convection	Poleward & eastward from center	Equatorward & eastward from center
2. Cloud system size	Width 15° latitude or more	Width usually less than 10° latitude
3. Interaction with environment	Convective cloud system remains connected to other synoptic systems (Some cold lows excepted)	Cloud system becomes isolated

B. DETERMINING ORIGIN

1. Frontal band - typical cloud structure
2. East of upper trough - amorphous convective cloud mass
3. Cold low - circular cloud pattern with limited convection near center

(From Herbert and Poteat, 1975)

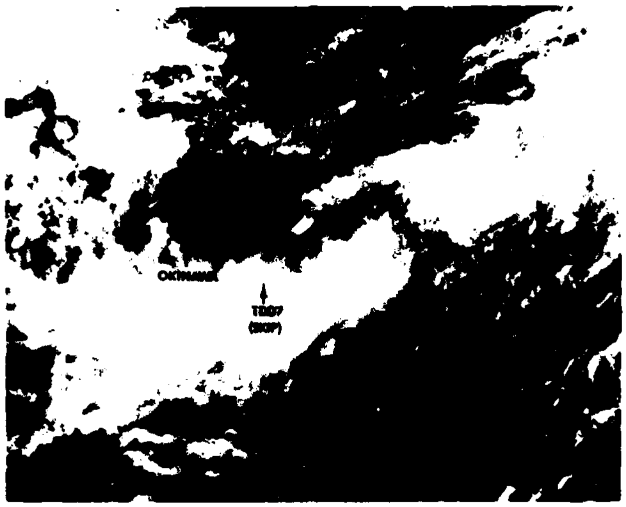


Figure 3-07-1. A developing low-level circulation can be detected within the confines of a broad large-scale cloud pattern. Weak upper-level outflow can be detected at 290526Z June (NOAA 7 visual imagery).

An aircraft investigative mission on 30 June located a 991 mb center with surface winds of 45 kt (23 m/sec), prompting the first warning to be issued at 300000Z. During the next 36 hours, Skip moved quickly northeastward along the frontal trough, averaging over 24 kt (44 km/hr), however its convection remained weak and generally restricted to within 120 nm (222 km) of its northern and eastern sides (Figure 3-07-2). Throughout Skip's lifetime, the Aerial Reconnaissance Weather Officers (ARWOs) consistently reported very little convection near the center, rather large light and variable wind centers, and an abundance of stratocumulus entrainment. By 011600Z July, all convection had dissipated from the vicinity of Skip's center and the upper-level anticyclone was no longer visible, indicating that the storm had completed its extratropical transition.

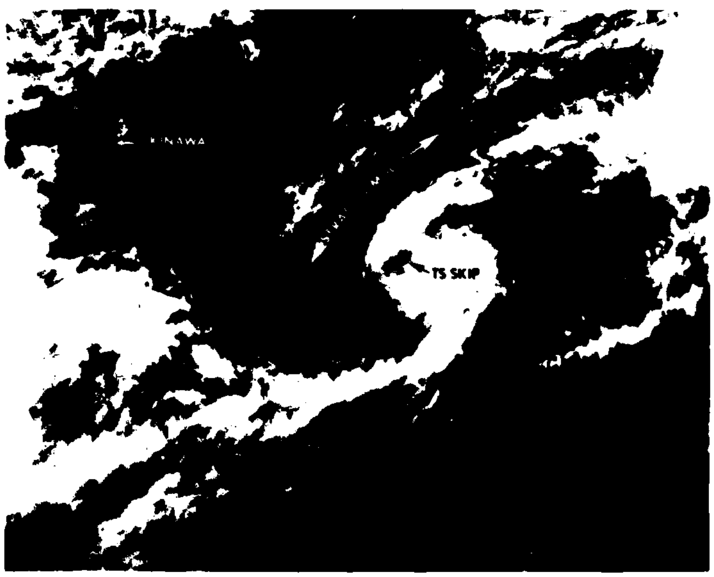


Figure 3-07-2. Tropical Storm Skip's exposed low-level circulation can be seen at 300514Z June to the south and west of its major convective area. Note the extent of stratocumulus to the north of this system. (NOAA 7 visual imagery).

As Skip was moving rapidly toward the northeast, a new circulation could be identified from 1 July synoptic data, just east of Taiwan. At this time, the frontal trough ran westward from Skip into the vicinity of northern Taiwan. Upper-level westerlies prevailed throughout the region although sharp ridging south of the 200 mb jet still maintained the large band of clouds. Isolated convection was present throughout this cloud mass, although none could be identified with the low-level circulation as it remained quasistationary. However, aircraft reconnaissance at 020115Z did identify a 995 mb center with winds up to 35 kt (18 m/sec) in the flow south of the circulation, thus a TCFA was issued. Convection finally began to develop near the circulation's center by 021200Z and, when the next aircraft mission found that the circulation had moved eastward and deepened to 987 mb, the first warning was issued at 030000Z. As was the case for Tropical Storm Skip, Val moved quickly northeastward along the trough, averaging over 26 kt (46 km/hr). Also like Skip, convection remained weakly organized and restricted to within 100 to 200 nm (185 to 370 km) of the system's center (mostly on the northern and eastern sides). As can be seen in Figure 3-07-3, Val still displayed its own individual outflow pattern despite being embedded within the larger cloud mass. By 040000Z, Val had lost all of its convection and could no longer be identified on satellite imagery as it completely merged into the frontal zone.

Both Tropical Storms Skip and Val contained many of the characteristics of subtropical cyclones identified in Table 3-07-1. Although monsoonal flow probably helped initiate Skip's low-level vortex, its further development and propagation can more likely be attributed to its position in relation to the eastern side of the upper trough. This is especially true of Val which formed farther north. Convection for both storms remained weak and unorganized and, partially due to strong westerly vertical shear, the low-level centers were often exposed with convection remaining poleward and eastward. Figures 3-07-2 and 3-07-3 show that each system did eventually become partially isolated from the dominance of the mid-latitude westerlies and displayed their own anticyclonic outflow pattern.

Re-analysis of synoptic and satellite data revealed that Skip and Val were not the only circulations to develop during this unique period. At 300000Z, Skip (located near 24N 137E) could be seen flanked by circulations (or frontal waves) at 34N 153E, 31N 143E and 20N 125E. Similar conditions occurred for Tropical Storm Val as well. On the synoptic-scale each was only a small part of an extensive mass of clouds along the eastern boundary of a very active mid-latitude upper-level trough.

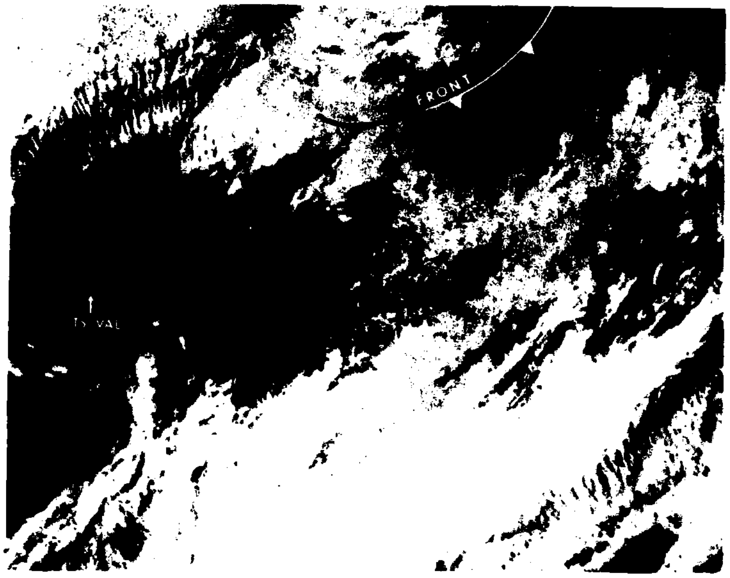
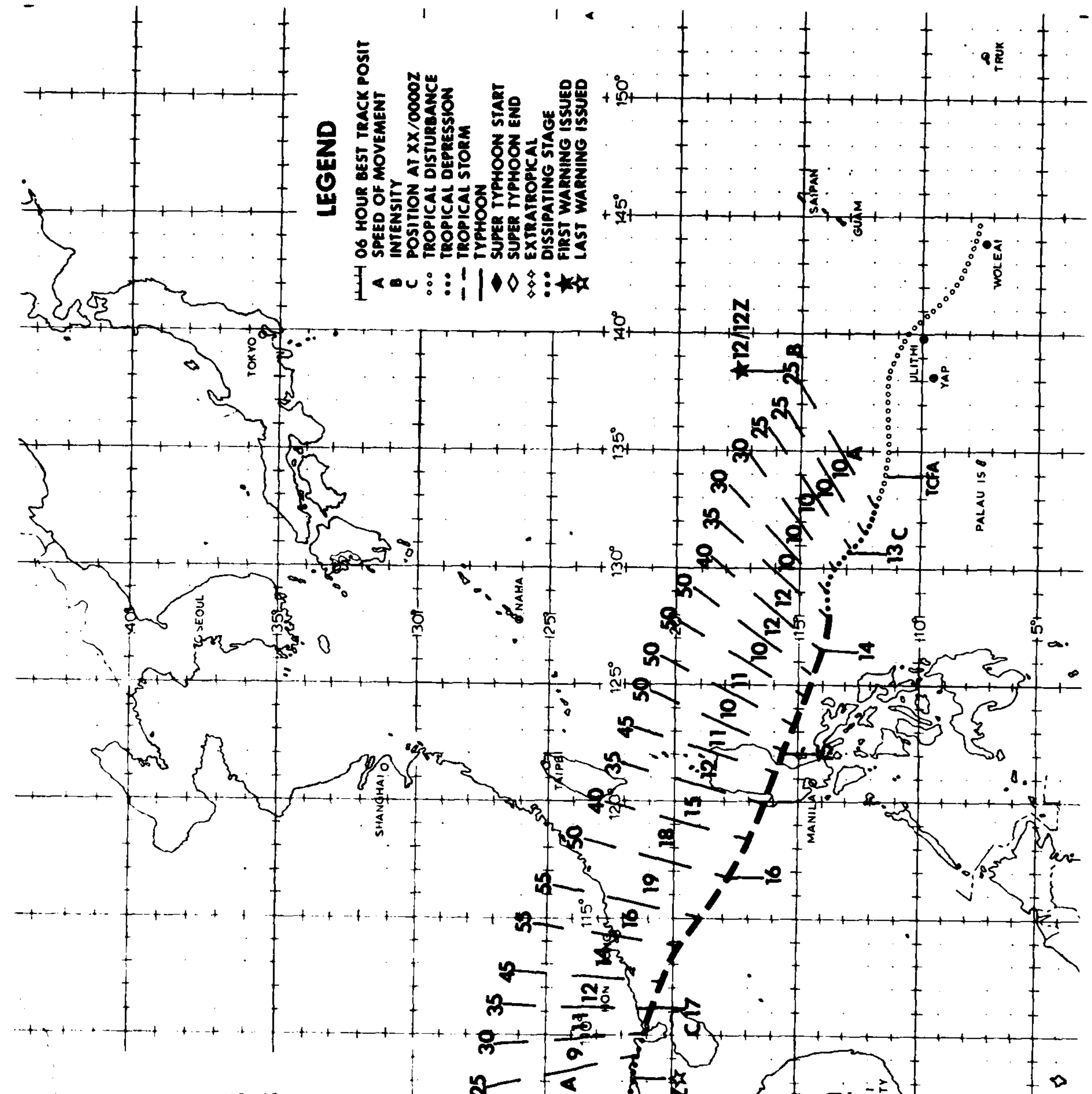


Figure 3-07-3. Tropical Storm Val's unorganized convection and outflow pattern can be seen with respect to larger frontal cloud mass pattern at 031723Z July. (NOAA 7 infrared imagery).



TROPICAL STORM
WINONA
BEST TRACK TC-09
12 JUL-17 JUL 1982
MAX SFC WIND 55 KTS
MINIMUM SLP 985 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SEOUL
SHANGHAI
TAIPEI
NAHA
MANILA
HANOI
HO CHI MINH CITY
BANGKOK
RANGOON
SAIPAN
GUAM
TRUK
WOLEAI
ULITHI
YAP
PALAU IS
TCFA
12/12Z
17/12Z

Tropical Storm Winona exemplifies tropical cyclone development without corresponding upper-level support. The presence of strong upper-level winds is often an inhibiting factor for significant tropical cyclone development. Based on JTWC's 200 mb synoptic data and streamline analyses, a strong subtropical ridge centered over central China was reinforcing strong upper-level winds over the Philippine Sea and South China Sea (See Figure 3-09-1). This situation persisted throughout Winona's warning period. The presence of 35 to 45 kt (17 to 23 m/sec) northeasterly winds in the upper-troposphere over Winona prevented the development of a strong anticyclonic outflow pattern and was a major factor in restricting further development to typhoon strength.

Winona's entire intensification process was slow. Between 10 and 12 July, three Tropical Cyclone Formation Alerts (TCFA) were issued as satellite imagery, synoptic and reconnaissance aircraft data revealed a persistent, but weak, disturbance moving westward through a primary tropical cyclone genesis region between Guam and the Republic of the Philippines. Reconnaissance aircraft investigative missions on the 10th and 11th found a weakly organized system with minimum sea level pressures of 1008 mb. At 121200Z, synoptic data gave the first indication that the disturbance was intensifying as gradient-level winds reported by Yap (WMO 91413) increased to 25 kt (13 m/sec). Simultaneously, the 200 mb streamline analysis indicated the development of a weak anti-

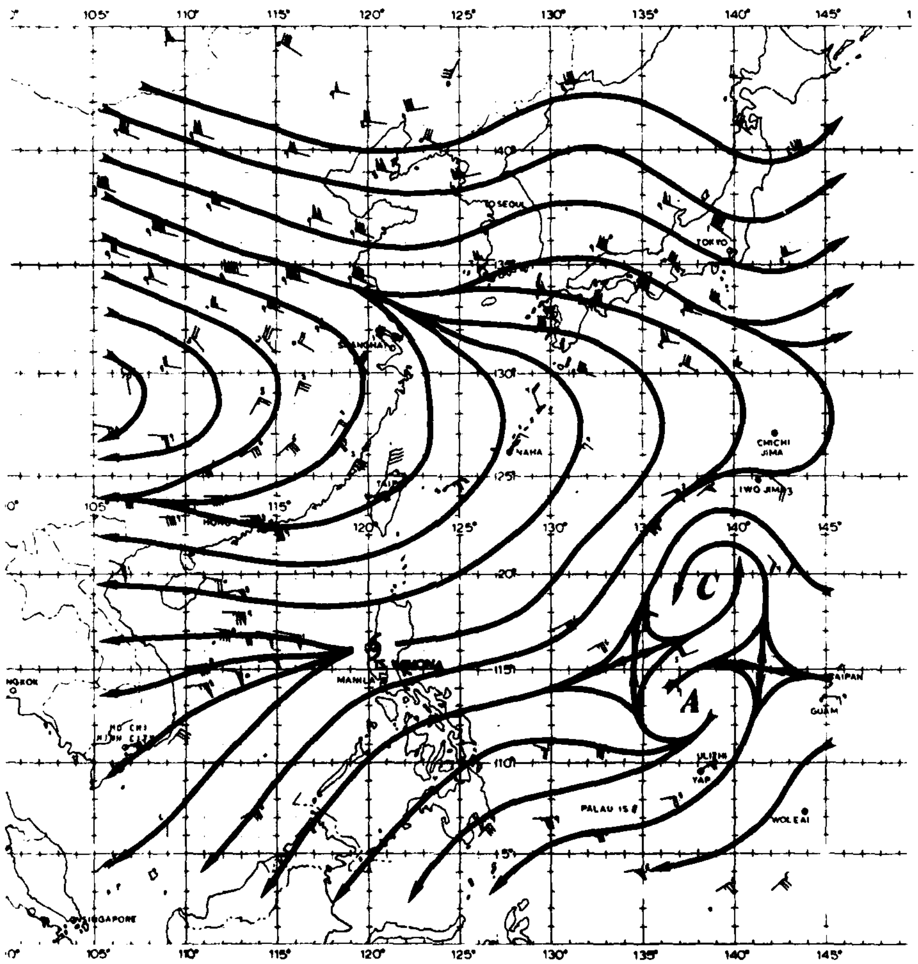


Figure 3-09-1. 200 mb streamline analysis at 151200Z July. Strong upper-level northeasterly winds prevent the development of outflow channels to the north.

Figure 3-09-2. Tropical Storm Winona at 55 kt (28 m/sec) intensity, 400 nm (741 km) northwest of central Luzon. Even at maximum intensity, Winona's upper- and lower-level centers are not aligned due to the presence of strong upper-tropospheric winds. 160707Z (NOAA 7 visual imagery).

cyclone over the disturbance. This information, combined with increasing convection and organization (apparent on satellite imagery), prompted the issuance of the initial warning for Tropical Depression 09 at 121400Z. Subsequent aircraft reconnaissance at 130036Z confirmed JTWC's suspicions of intensification when it was reported that the minimum sea level pressure had dropped to 1000 mb.

From the initial warning, JTWC forecasts predicted that Winona would move into a region of strong upper-level winds which would inhibit its development. Thus, a maximum intensity of 50 kt (26 m/sec) was forecast prior to Winona's expected landfall upon central Luzon. Winona's intensity and movement were well-forecast during this period as it proceeded west-northwestward along the southern periphery of the subtropical ridge, centered along 25N.

By 140600Z, Winona reached the forecast 50 kt (26 m/sec) intensity which it maintained until landfall on Luzon at 150500Z. As Winona crossed central Luzon, it passed 35 nm (65 km) north of Clark AB, where maximum sustained winds recorded were 23 kt (12 m/sec) with peak gusts to 30 kt (15 m/sec). Reported damage to the surrounding region was estimated at $275,000 with 272 families left homeless as a result of severe flooding.

Winona entered the South China Sea as a minimal tropical storm, but upon reaching open waters, its convection increased and Winona reintensified to a peak intensity of 55 kt

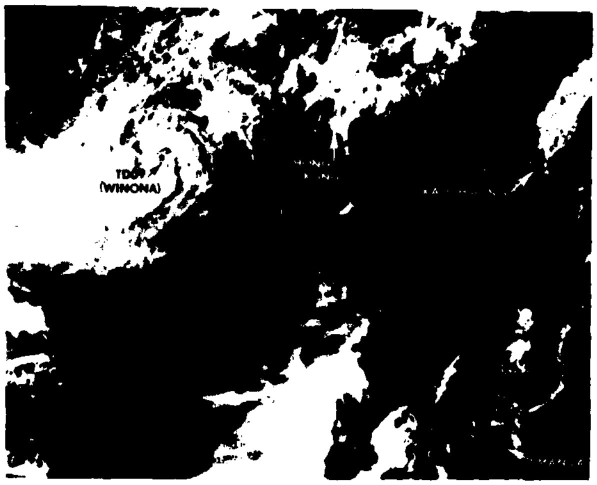
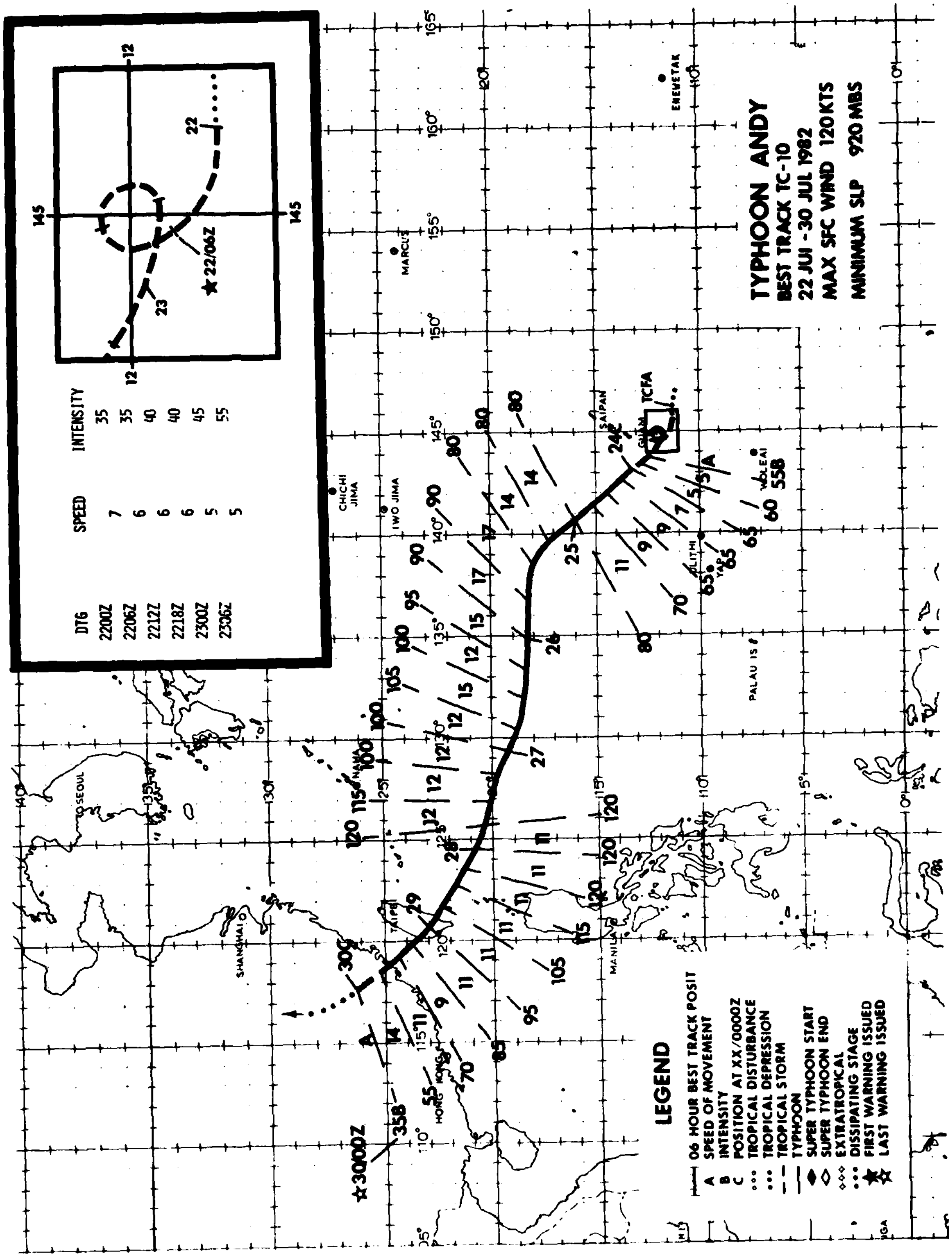


Figure 3-09-3. Winona after being downgraded to a tropical depression 210 nm (389 km) west-southwest of Hong Kong. Notice the persistent strong upper-level shear. 170655Z July (NOAA 7 visual imagery).

(28 m/sec) at 160600Z (Figure 3-09-2). This intensification occurred even though 40 kt (21 m/sec) 200 mb winds persisted over the area. However, based on limited 500 and 700 mb data, it appears that the strong winds did not extend into the mid-tropospheric levels. This situation allowed Winona's convection to develop well into the mid-tropospheric levels while the strong upper-level winds provided a sufficient outflow channel to the southwest.

Winona was forecast to move northward along the western periphery of the subtropical ridge upon entering the South China Sea. However, a 500 mb synoptic track completed by the 54th Weather Reconnaissance Squadron at 151200Z showed that a second ridge had developed east of Taiwan, resulting in a steering flow over the South China Sea toward the west-northwest. The 151800Z and subsequent forecasts reflected this new information and projected Winona on a west-northwestward track, with landfall expected southwest of Hong Kong.

After reaching maximum intensity on 16 July, Winona weakened as wind shear in the mid- and upper-layers increased. Winona became an exposed low-level system as its convective center was sheared to the southwest early on 17 July. By 170600Z, Winona was downgraded to a tropical depression as it passed 40 nm (74 km) north of Hai-Nan Island (See Figure 3-09-3). Further dissipation as a significant tropical cyclone occurred as it moved toward the China-Vietnam coastline on 18 July.


TYPHOON ANDY
BEST TRACK TC-10
22 JUL - 30 JUL 1982
MAX SFC WIND 120 KTS
MINIMUM SLP 920 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
DTG SPEED INTENSITY
2200Z 7 35
2206Z 6 35
2212Z 6 40
2218Z 6 40
2300Z 5 45
2336Z 5 55
22/06Z
3000Z
TCFA
SEOUL
SHANGHAI
TAIPEI
HONG KONG
MANILA
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ENEWETAK
WOLEAI
ULITHI
YAP
PALAU IS

Andy formed on the northern edge of a zone of maximum cloudiness associated with the monsoon trough south of Guam. Prior to 22 July, the low-level westerlies were well established along 10N and extended eastward to the dateline. Satellite imagery on 20 July showed this maximum cloud zone had begun to segment. Within 24 hours the cloudiness consolidated into three distinct masses centered near 132E, 148E and 168E. Each cloud mass was poorly defined but had rudimentary banding features. The cloud system centers near 148E and 168E drifted westward, intensified, and became Typhoon Andy and Super Typhoon Bess (11) respectively. The cloud mass near 132E drifted westward and was disrupted by the combined effects of the rugged terrain over the Philippines and vertical wind shear from a tropical upper-tropospheric trough (TUTT).

A Tropical Cyclone Formation Alert (TCFA) was issued for the area south of Guam at 211900Z due to significant pressure falls (to below 1004 mb), increased convection, and convective organization. Aircraft reconnaissance at 220229Z located a small, tight circulation center with a minimum sea level pressure of 995 mb. These data, along with observed winds of 35 to 40 kt (18 to 21 m/sec) prompted the issuance of the first warning. Although intensification was evident from 20 to 24 July on satellite imagery, the cloud pattern remained poorly defined and the circulation center was difficult to position -- except for a brief period on 23 July, when the low-level center was visible on the satellite imagery. Aircraft reconnaissance was an invaluable asset during this period; no other reconnaissance platform was capable of following the low-level wind center, particularly since there was considerable interest on Guam as the fix data received implied an anticyclonic loop 35 nm (65 km) in diameter just 90 nm (167 km) south of the island.

Figure 3-10-1. At 240530Z July Andy, shortly after reaching typhoon strength, is shown 125 nm (232 km) west of Guam (see arrow). During this time the strong south-westerly fetch south of Typhoon Andy brought phenomenal surf to Guam. (NOAA 7 visual imagery)

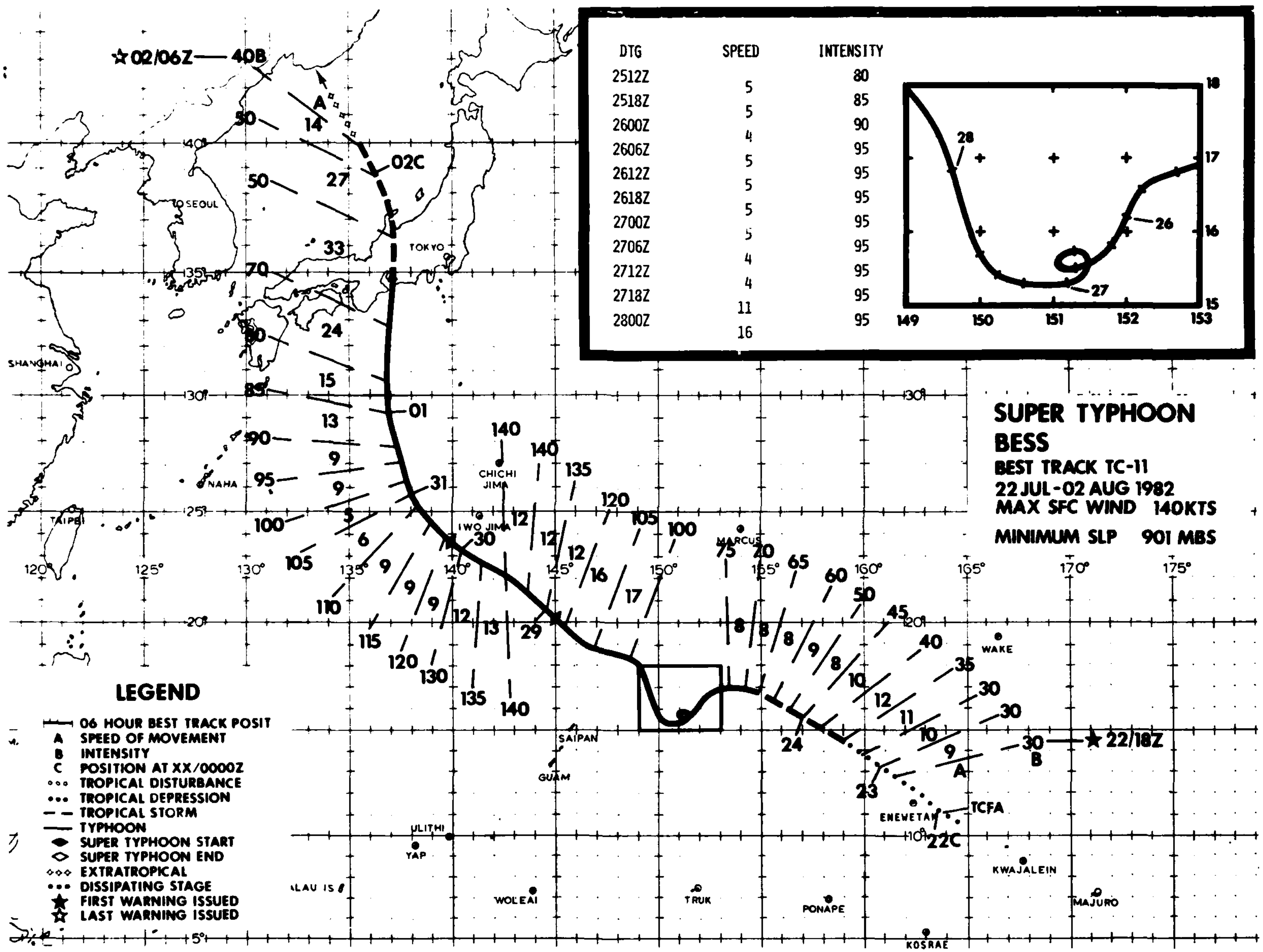
While Andy was undergoing the loop south of Guam, several meteorological factors were influencing the synoptic situation. Rawinsonde observations from Chichi Jima (WMO 47971) at 221200Z and 230000Z revealed 500 mb height falls of 10 to 20 meters. These falls indicated a weakening of the subtropical ridge north of Andy as well as a lessening of the steering current, factors probably accounting for Andy's lack of forward movement. In addition, reconnaissance aircraft consistently reported Andy's 700 mb center 10 to 20 nm (19 to 37 km) south of the surface center. This tilt, half of the diameter of the loop, suggests that Andy's actual movement during this period might have been virtually nil, and may have been more related to the fix accuracies and the internal dynamics of the developing tropical cyclone. However, for best track purposes, this period is described well by the loop.

After completing the loop, Andy accelerated to the northwest and intensified. In Andy's wake, Guam experienced phenomenal surf on exposed southern and western beaches as a strong southwesterly fetch was brought to bear on the island on 24 July (See Figure 3-10-1). Andy's northwestward track turned abruptly toward the west as the cyclone

Figure 3-10-2. Typhoon Andy as seen by radar from Hua Lien (WMO 46699) at 281900Z July (Photograph courtesy of Central Weather Bureau; Taipei, Taiwan)

reached 18N on 25 July. This track change occurred while reported 500 mb heights rose at Chichi Jima, to the northeast of Andy. From this point onward, Andy remained equatorward of and parallelled the subtropical ridge axis.

While Andy was tracking westward, upper-level outflow channels to the east (south of the TUTT axis) and to the southwest (return flow from the monsoon over southeast Asia) provided a favorable environment for intensification. At 271800Z, Andy reached a maximum intensity of 120 kt (62 m/sec). Until making landfall upon the southern portion of Taiwan on 29 July (See Figure 3-10-2), Andy's intensity remained over 100 kt (51 m/sec). Taiwan experienced torrential rains from the typhoon's passage; especially hard hit was the eastern coastal area, where considerable damage from flooding was reported. Weakened from Taiwan's rugged terrain, Andy continued westward, across the Formosa Strait, and dissipated in the mountainous area of southeastern China on 30 July.



DTG	SPEED	INTENSITY
2512Z		80
2518Z	5	85
2600Z	5	90
2606Z	4	95
2612Z	5	95
2618Z	5	95
2700Z	5	95
2706Z	5	95
2712Z	4	95
2718Z	4	95
2800Z	11	95
	16	

Bess formed at the eastern end of a maximum cloud zone associated with the monsoon trough anchored south of Guam. By 21 July, this area of cloudiness had separated into three masses near 132E, 148E, and [illegible]E. The two easternmost cloud masses continued to develop and became Typhoon Andy (10) and Super Typhoon Bess. The third area dissipated over the Philippine Islands.

A Tropical Cyclone Formation Alert was issued for an area near 11N 165E at 211900Z. Observations from Kwajalein (WMO 91336) and Ailinglaplap (WMO 91367) showed that sea level pressures had continued to fall in the region, and satellite imagery indicated increased convection and organization in the cloud system.

The first warning, with maximum winds of 30 kt (15 m/sec), was issued at 221800Z when the curvature of loosely organized cloud bands into the central cloud mass increased. Initial forecasts for Bess indicated a track toward the northwest, in response to an east-southeasterly flow at low- and mid-levels. Reconnaissance aircraft missions during the period 222200Z to 232200Z indicated that the surface and 700 mb centers were not well-aligned vertically. Once this feature was eliminated, Bess began to intensify and by 241800Z, it was upgraded to typhoon strength based upon satellite imagery which indicated a 30 nm (56 km) eye had developed.

Bess maintained its northwestward track for the first 48 hours in warning status. However, by 241800Z a noticeable decrease in the speed of movement was observed as Bess began to move toward the west-northwest. This change in motion was thought to be the result of westward building of the subtropical ridge to the north. Consequently, the forecast track was changed to a more westward heading. Contrary to JTWC expectations, Bess took a turn toward the southwest at 251200Z. Subsequent analysis of satellite imagery indicates that a short wave trough had just passed to the north of the circulation. The enhanced northwesterly flow behind this trough forced Bess toward the southwest. During this period, Bess slowed to 5 kt (9 km/hr) and completed a 20 nm (37 km) diameter cyclonic loop, while its intensity remained at 95 kt (49 m/sec). Further intensification did not occur and Bess remained on its southwestward track until another short wave trough moved eastward from Japan on 27 July. In response to this trough, Bess took a noticeable turn north-northwestward until 280600Z when Bess began moving toward the northwest along the southwestern extension of the subtropical ridge. While moving northwestward, a rapid intensification period began, culminating in the attainment of super typhoon strength and a peak intensity of 140 kt (72 m/sec) at 290600Z.

As Bess approached 25N, a decrease in forward movement was observed; numerical forecast fields and the JTWC 500 mb analysis of 30 June indicated a weakness forming n the subtropical ridge over the southern islands of Japan which would allow Bess to take a more northward track. As Bess entered the south-southeasterly flow associated with the western periphery of the subtropical ridge, interaction with the mid-latitude westerlies was expected to occur within 36 hours and Bess was forecast to recurve along the southern coast of Japan. Bess, however, maintained a northward track. The Typhoon Acceleration Prediction Technique TAPT (Weir, 1982) was employed, and correctly forecast significant acceleration commencing near 28N. From this latitude, Bess did begin to accelerate toward the north and eventually merged with a low pressure center in the Sea of Japan on 02 August.

Bess passed over the Araumi Peninsula on central Honshu where extensive damage and human suffering were reported. The greatest damage was caused by torrential rainfall which set off 1,557 landslides and flooded over 27,000 homes, leaving 25,000 persons homeless, and 59 dead. More than 25 ships ran aground or were lost, over 100 bridges were washed out, and nearly 300 acres (741 hectares) of farmland were flooded.

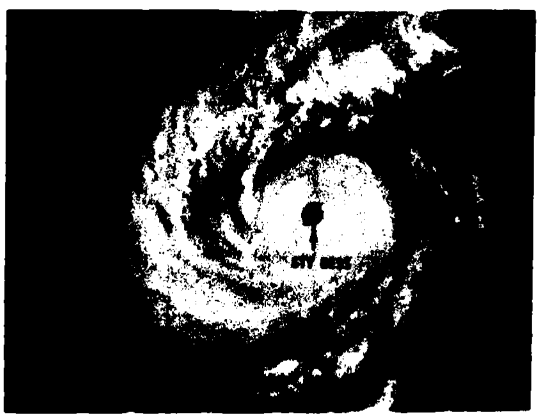
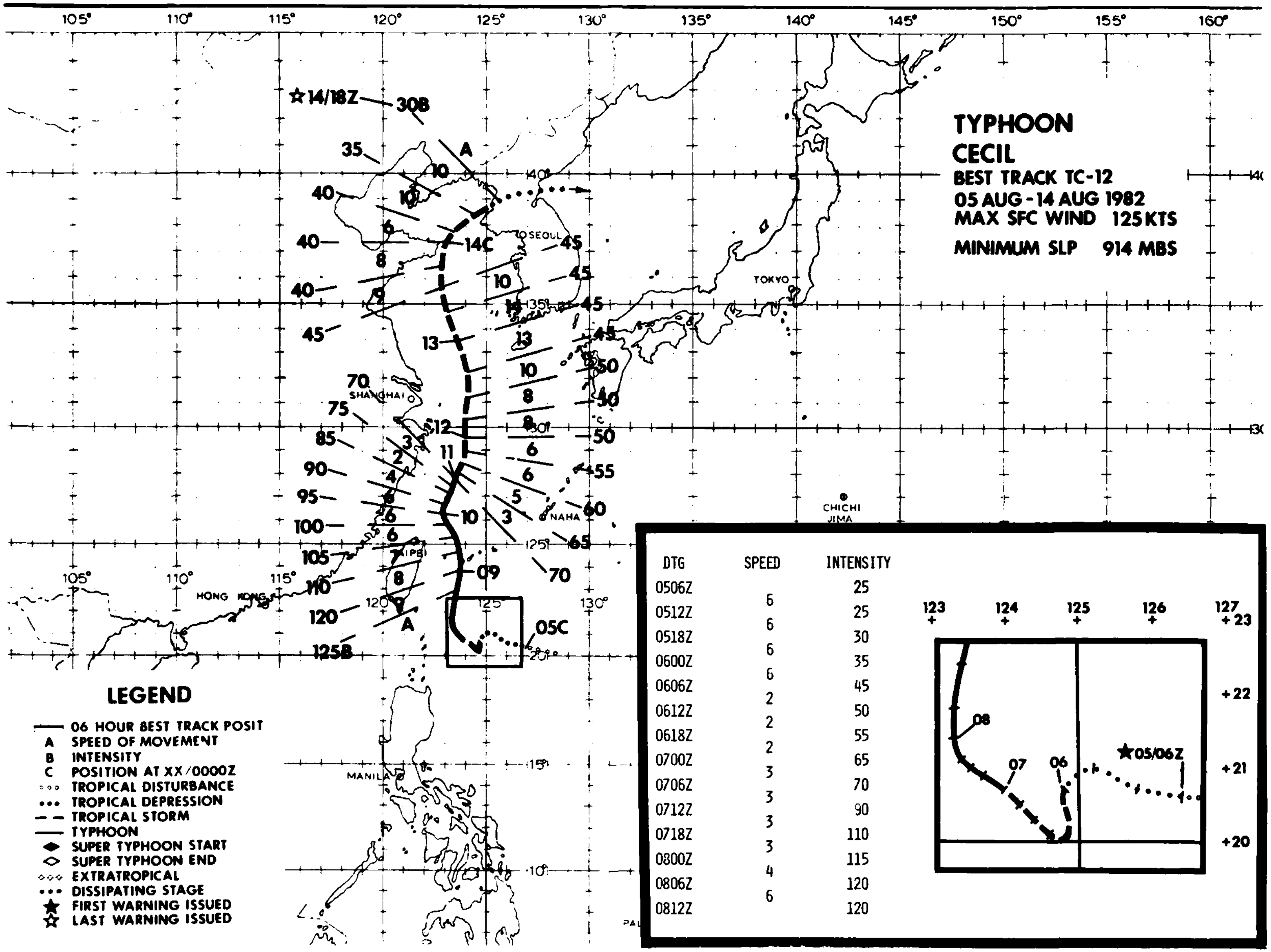


Figure 3-11-1. Super Typhoon Bess at maximum intensity. 290430Z August (NOAA 7 visual imagery).



DTG	SPEED	INTENSITY
0506Z		25
0512Z	6	25
0518Z	6	30
0600Z	6	35
0606Z	6	45
0612Z	2	50
0618Z	2	55
0700Z	2	65
0706Z	3	70
0712Z	3	90
0718Z	3	110
0800Z	3	115
0806Z	4	120
0812Z	6	120

The tropical disturbance which later became Typhoon Cecil was first distinguishable as a low-level circulation about 250 nm (463 km) north of Truk (WMO 91334) on 31 July. This disturbance persisted as a closed circulation on the surface streamline analyses and as an area of enhanced convective activity on satellite imagery that travelled westward along the monsoon trough for the next four days. Although mentioned in four consecutive Significant Tropical Weather Advisories (ABEH PGTW), a Tropical Cyclone Formation Alert (TCFA) was not issued on the system during this period because a strong easterly flow at upper-levels was expected to inhibit development of the disturbance. Figure 3-12-1 is typical of the upper-level (200 mb) flow during this period. On 4 August, increased convective activity was apparent from satellite imagery, ship reports in the area indicated that central pressures had dropped to 1000-1003 mb and weakening of the upper-level easterlies was indicated by the 200 mb analysis data. When it became evident that the disturbance had indeed intensified, and that further intensification was likely, a TCFA was issued at 041400Z.

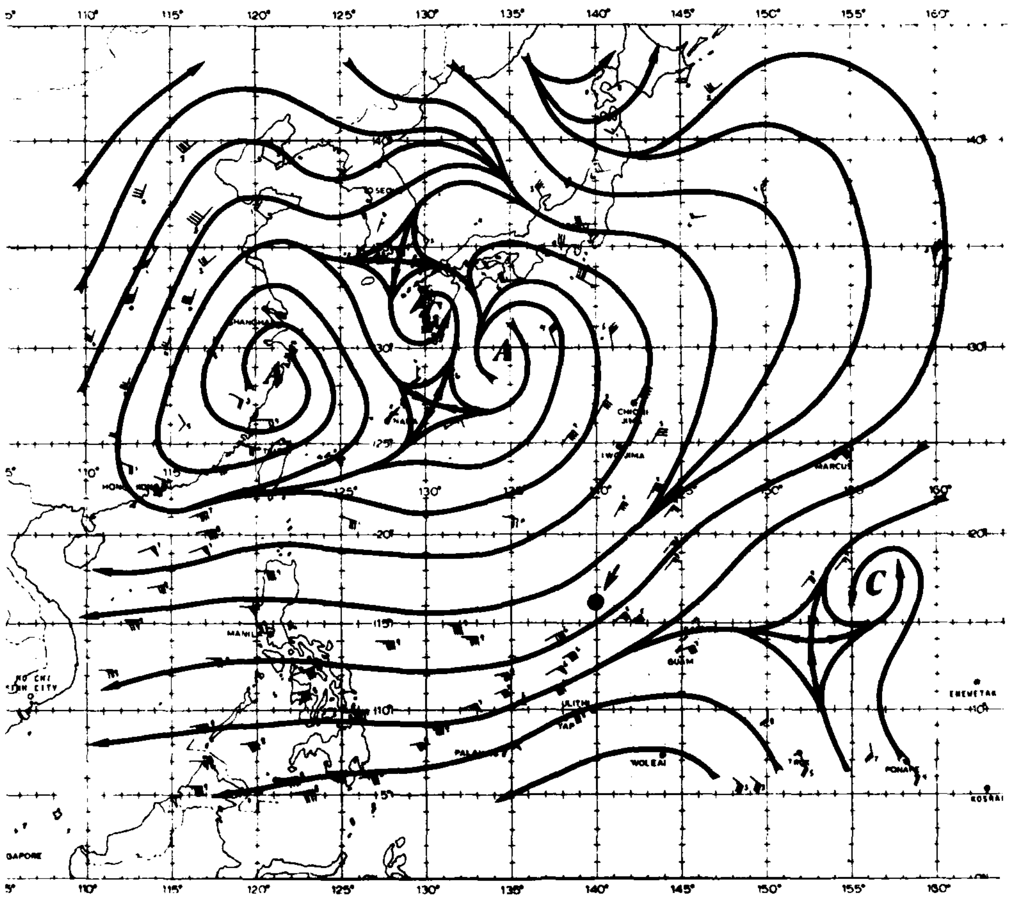


Figure 3-12-1. 030000Z August 200 mb streamline analysis. The location of the surface circulation is indicated by the dark circle.

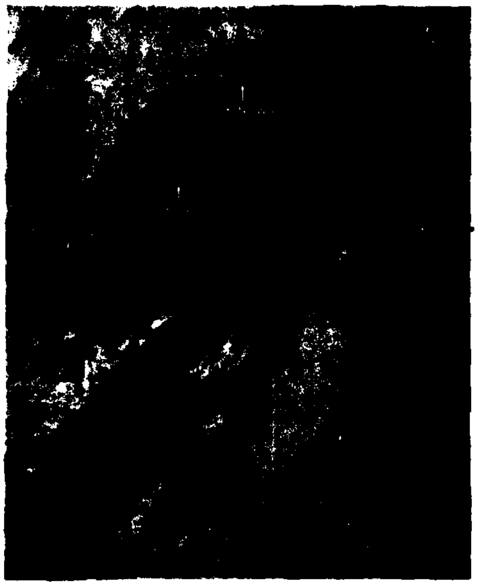


Figure 3-12-2. 081838Z August (NOAA 7 infrared imagery).

The first warning on Tropical Depression 12 was issued at 050600Z after an aircraft reconnaissance mission observed sustained winds of 25 kt (13 m/sec) associated with the circulation. Tropical Depression 12 continued to track westward under the influence of easterly steering currents along the southern periphery of the subtropical ridge. Upgraded to tropical storm status on 6 August, Cecil turned southward, slowed to 3 kt (6 km/hr), and then turned northwestward. From 6 to 8 August, Cecil intensified from 35 kt (18 m/sec) to 115 kt (59 m/sec), reaching a peak intensity of 125 kt (64 m/sec) at 081800Z while located 120 nm (222 km) east of Taiwan (figures 3-12-2 and 3-12-3).

As Cecil approached Taiwan from the southeast, its track turned sharply northward until reaching 25N when Cecil once again assumed a more northwestward track. Although Cecil never approached closer than 80 nm (148 km) to Taiwan, heavy rains associated with its peripheral circulation touched off landslides which killed at least 19 people in Wu-Koo County, near Taipei.

On 10 August, Cecil turned toward the north-northeast and the combined effects of colder ocean temperatures, vertical wind shear, and cooler surrounding air began to take their toll. Within three days after reaching maximum intensity, Cecil was downgraded to a tropical storm.

Figure 3-12-3. Typhoon Cecil as seen by radar from Hua Lien (WMO 46699) at 081900Z August (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan).

As a tropical storm, Cecil continued to move northward in response to steering from an extension of the subtropical ridge which had built northward into the Sea of Japan. The situation at 500 mb is illustrated by the 101200Z August 500 mb streamline analysis (Figure 3-12-4) which is typical of the mid-level synoptic pattern during Cecil's northward movement.

By 14 August, Cecil, located near 38N 124E, was beyond the northward influence of the subtropical ridge and entering an area of westerly flow. Cecil moved eastward in response to its new environment and made landfall on Korea with 35 kt (18 m/sec) winds. Although, at this time, Cecil was a weak storm in terms of wind intensity, there was a great deal of precipitation associated with the circulation. Heaviest rains, 21.2 inches (55 cm), were recorded in Sanchong, resulting in severe flooding which left 35 dead, 28 missing, and 42 injured in addition to an estimated 30 million dollars in property damage. Cecil's circulation was unable to reorganize after crossing the Korean peninsula and dissipated in the Sea of Japan on 15 August.

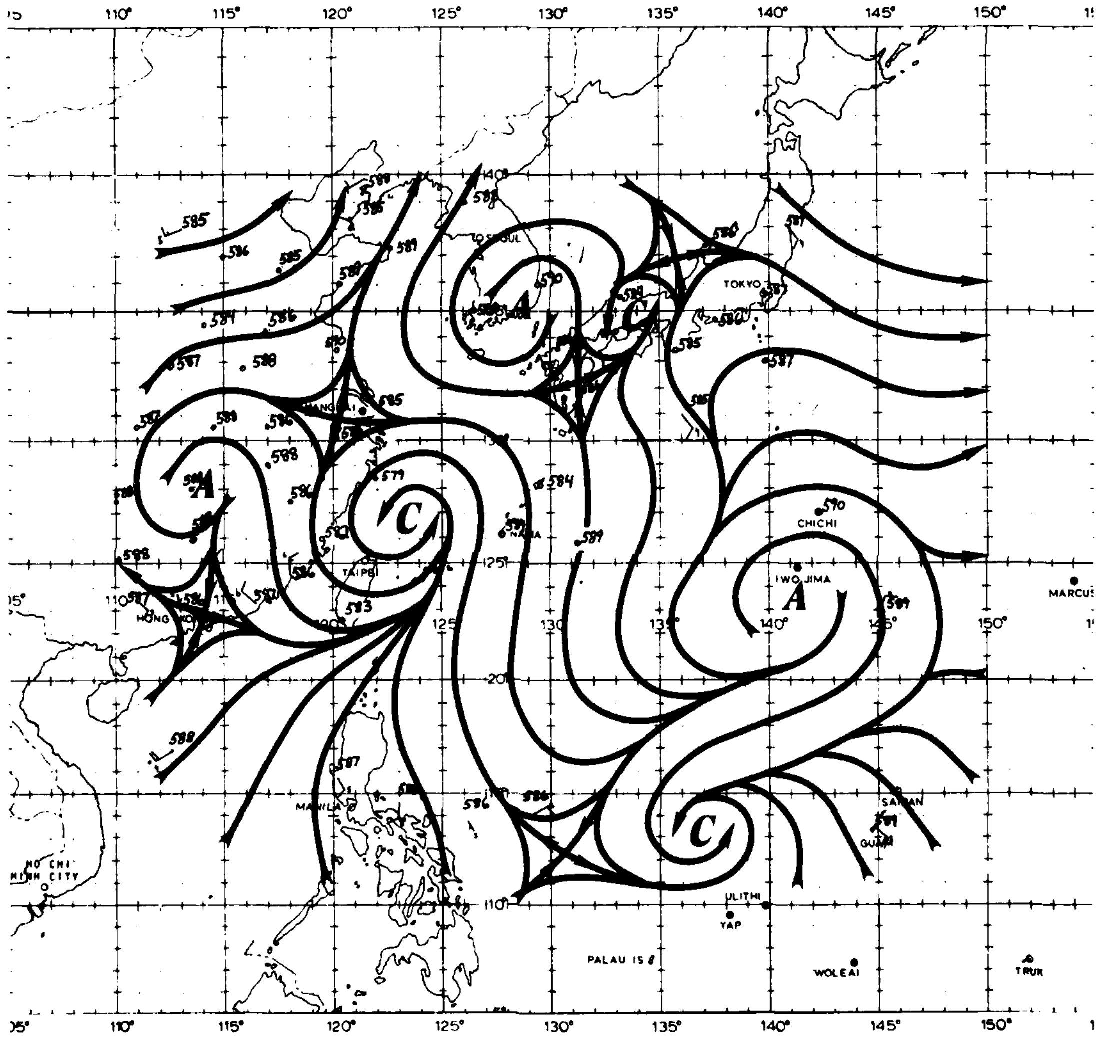
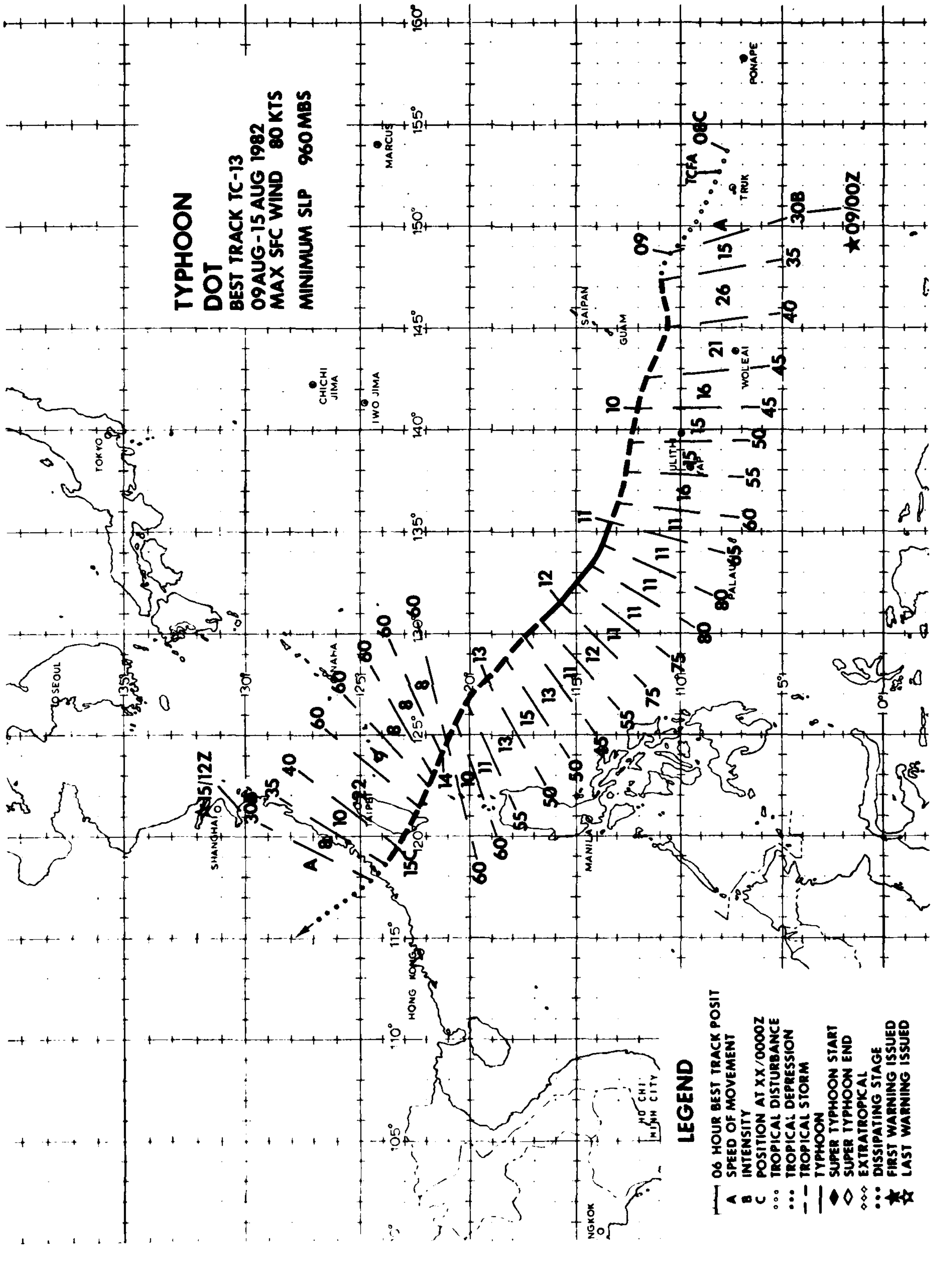


Figure 3-12-4. 101200Z August 500 mb streamline analysis.


TYPHOON
DOT
BEST TRACK TC-13
09AUG-15AUG 1982
MAX SFC WIND 80 KTS
MINIMUM SLP 960 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SEOUL
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
HO CHI MINH CITY
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
PALAU
TRUK
PONAPE
TCFA
09/00Z
15/12Z

The origins of Typhoon Dot can be traced back to a weak surface circulation located near Kwajelein (WMO 91366) on the 5th of August. Surface winds associated with this circulation were 5 to 10 kt (3 to 5 m/sec) and the minimum surface pressure was 1008 mb. Over the next two days, as the circulation drifted northwestward, it remained fairly weak with loosely organized convection and light winds. On 8 August, a reconnaissance aircraft mission into the area showed that the circulation had maximum sustained winds of 20 kt (10 m/sec) but that the surface circulation was still very broad with relatively unorganized convection. However, satellite imagery and 200 mb data indicated that an upper-level anticyclone was present in the area, although not vertically aligned with the surface center. A Tropical Cyclone Formation Alert (TCFA) was issued at 080500Z based upon the persistence of the system and the presence of upper-level conditions that could lead to intensification of the disturbance. The initial warning on Tropical Depression 13 was issued at 090000Z when satellite imagery indicated that the cloud pattern associated with the developing depression was becoming more organized along with increased convective activity.

A reconnaissance aircraft mission at 090118Z observed surface winds of 35 kt (18 m/sec) and an extrapolated minimum sea level pressure of 1003 mb. Based on these data, Tropical Depression 13 was upgraded to Tropical Storm Dot at 090600Z. During this period, the subtropical ridge was well established to the north of the system; thus Dot was forecast to track westward and to continue to intensify. Dot lived up to these expectations, moving westward and reaching typhoon strength on 11 August. However, after reaching a maximum intensity of 80 kt (41 m/sec), Dot began to weaken as upper-level outflow channels became restricted due to interaction with Typhoon Cecil (12) located to the northwest. This interaction is easily seen on satellite imagery (Figure 3-13-1 shows the early stages of this interaction); at this time, Cecil was located northeast of Taiwan with maximum winds of 90 kt (46 m/sec) and Tropical Storm Dot, with maximum sustained winds of 50 kt (26 m/sec), was rapidly intensifying and would achieve maximum sustained winds of 80 kt (41 m/sec) on the following day. Although there was some interference in the upper-level outflow between the two cyclones, Dot's outflow channels to the northeast and southwest were well established. Figure 3-13-2 shows the relationship between the two cyclones two and one-half days later. Although the satellite pass was not optimally located, features of interest are readily observable, i.e., Dot's outflow channels to the north were completely cut off by the strong northeasterly winds associated with Cecil's outflow. The 200 mb analysis for

Figure 3-13-1. Satellite imagery shows Typhoon Cecil at the upper left and Tropical Storm Dot at the lower right. 100529Z August (NOAA 7 infrared imagery).

Figure 3-13-2. Satellite imagery shows Tropical Storm Cecil at the upper left and Tropical Storm Dot at the lower left. 121750Z August (NOAA 7 infrared imagery).

this period (Figure 3-13-3) shows that flow was unidirectional over Dot, with no indication of an anticyclone at that level.

As the distance between Cecil and Dot increased over the next few days, Dot regained intensity, reaching maximum sustained winds of 60 kt (31 m/sec) on the 13th. Figure 3-13-4 shows the relationship between Dot's intensity and the separation between the two cyclones. The data indicate a correlation between separation and Dot's intensity once the separation distance fell below 1000 nm (1852 km).

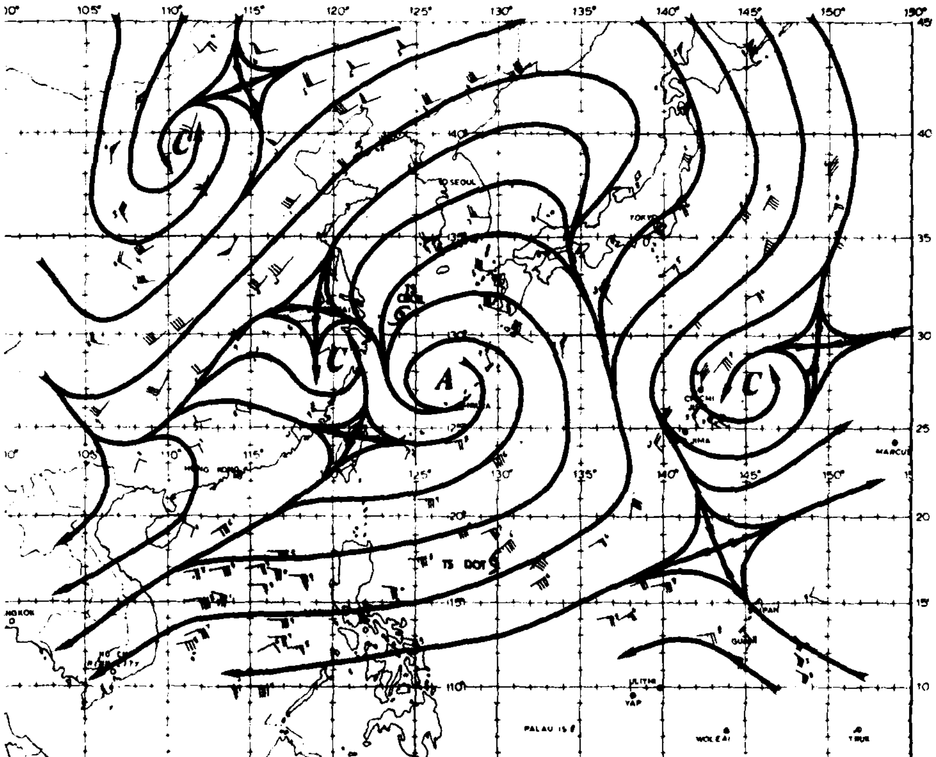


Figure 3-13-3. 121200Z 200 mb analysis with surface position of Tropical Storms Cecil and Dot superimposed.

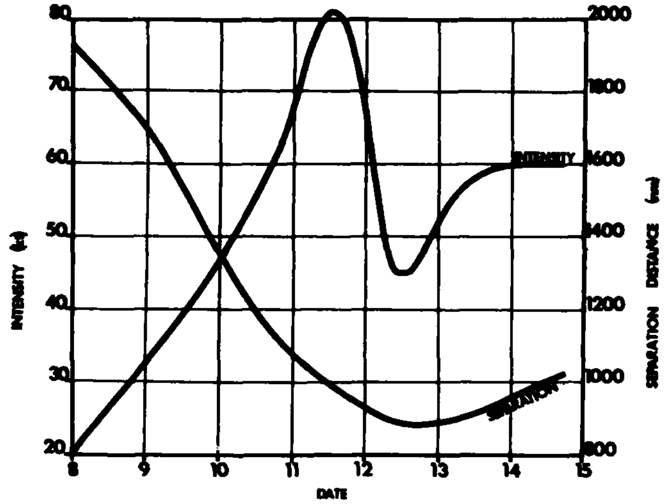


Figure 3-13-4. Variation in intensity as a function of time and separation between Dot and Cecil.

As Dot continued westward along the southern periphery of the subtropical ridge, several forecasts were issued indicating Dot would follow Cecil and turn toward the north prior to reaching Taiwan. However, the subtropical ridge was reestablished in the region to the north of Taiwan after Cecil's passage; subsiding air between the two tropical cyclones probably contributed to the ridging in this area, thereby causing Dot to continue its movement westward toward Taiwan. Although Dot's passage over Taiwan was rapid, the rugged topography of the island had a devastating effect on Dot's low-level circulation. Figure 3-13-5 shows Dot as a well-organized tropical storm with maximum sustained winds of 60 kt (31 m/sec) prior to landfall. Figure 3-13-6 shows Dot 12 hours later in the Formosa Strait, barely distinguishable as a tropical storm. Dot never recovered from the effects of this crossing and dissipated less than a day later over the mountainous regions of eastern China.

Figure 3-13-5. Tropical Storm Dot was approaching Taiwan from the southeast, as seen by radar from Hua Lien (WMO 46699) at 141400Z August (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan).

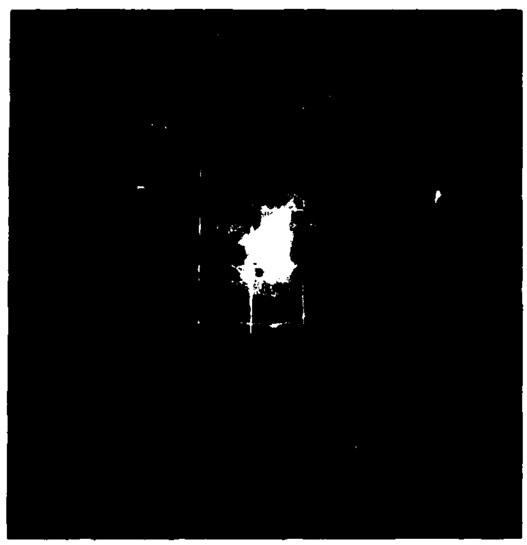
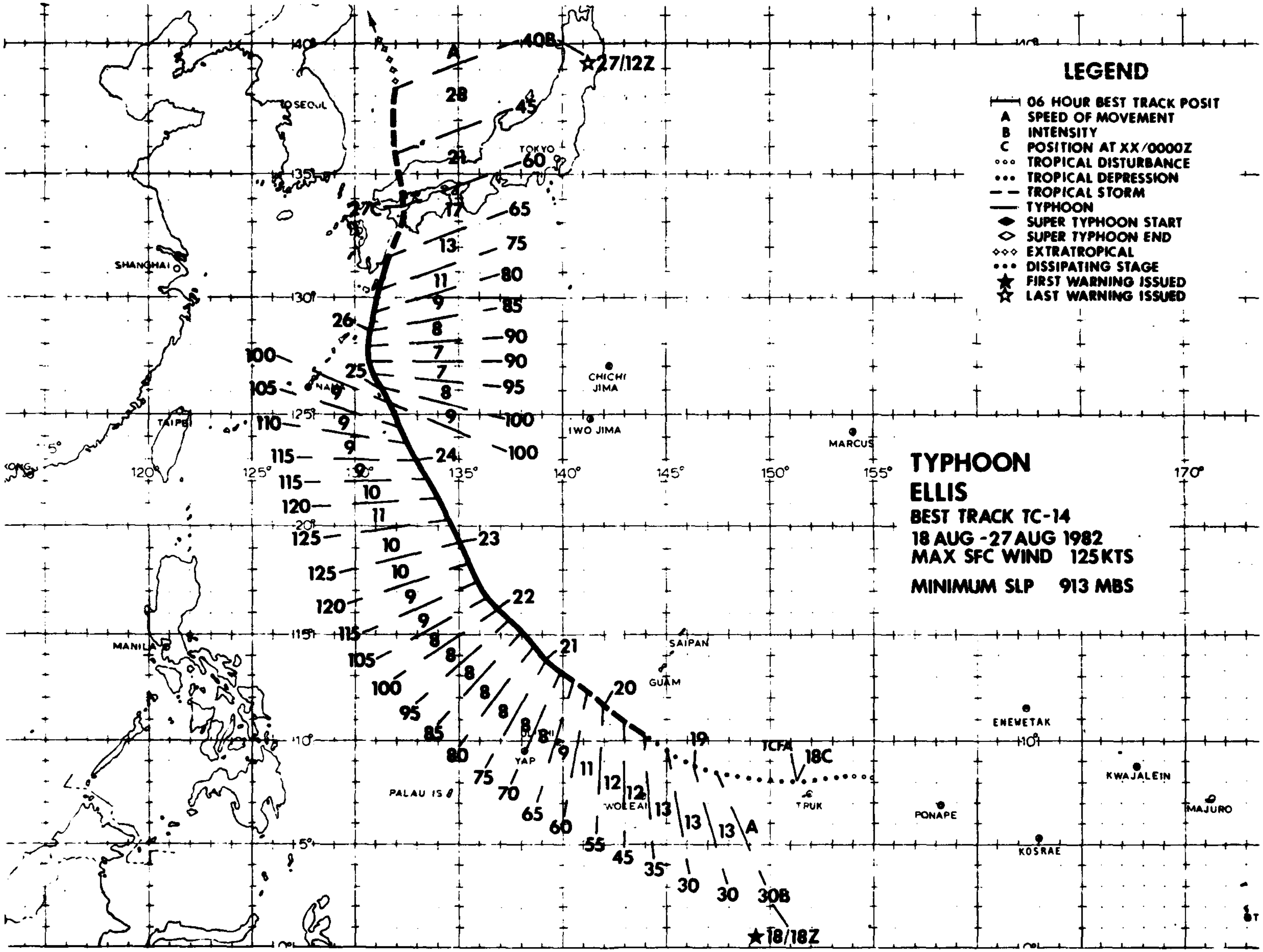


Figure 3-13-6. Tropical Storm Dot, located in the Formosa Strait after crossing southern Taiwan, as seen by radar from Kao-hsiung (WMO 46744) at 150200Z August (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan).



LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TYPHOON
ELLIS
BEST TRACK TC-14
18 AUG - 27 AUG 1982
MAX SFC WIND 125 KTS
MINIMUM SLP 913 MBS
27/12Z
18/18Z
TCFA
SEOUL
TOKYO
SHANGHAI
TAIPEI
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
YAP
WOLEAI
PALAU IS
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO
KOSRAE

Typhoon Ellis developed from a disturbance that was first detected within the monsoon trough south of Ponape on 15 August. From initial detection to the issuance of a Tropical Cyclone Formation Alert (TCFA) on 18 August, the disturbance slowly acquired convective organization. Once organized, development was quite rapid, with Ellis reaching a peak intensity of 125 kt (64 m/sec) on 23 August.

The TCFA was issued at 180100Z when satellite imagery identified a cloud mass near 8N 151E that had acquired an upper-level outflow channel to the southwest. At 180402Z, the initial reconnaissance aircraft mission located a 20 kt (10 m/sec) circulation center 85 nm (157 km) northwest of Truk Atoll. During the next 24 hours, satellite imagery provided fix positions on the convective center that showed movement toward the west-northwest at speeds approaching 16 kt (30 km/hr).

Based on continued convective organization, the first warning was issued for Tropical Depression 14 at 181800Z. At 191108Z, data from the second reconnaissance aircraft mission indicated maximum winds of 35 kt (18 m/sec) were present and, at 191200Z, Tropical Depression 14 was upgraded to Tropical Storm Ellis. On the 19th Ellis began tracking more north-westward in response to weaker steering currents south of 15N. From the first warning until the seventh warning (200600Z) the forecast scenario anticipated an initial jog to the northwest then, as Ellis began interacting with the subtropical ridge, it would return to a more westward heading. However, a deep mid-latitude trough (near 40N 115E at 200000Z) began to weaken the subtropical ridge southwest of Japan and the anticipated westward movement never materialized. By 201200Z, the effects of this mid-latitude trough on the strength of the subtropical ridge became evident and the forecast track was shifted toward the northwest.

On 20 August, satellite imagery (Figure 3-14-1) indicated the development of a banding-type eye. Ellis was upgraded to typhoon strength at 210000Z when both

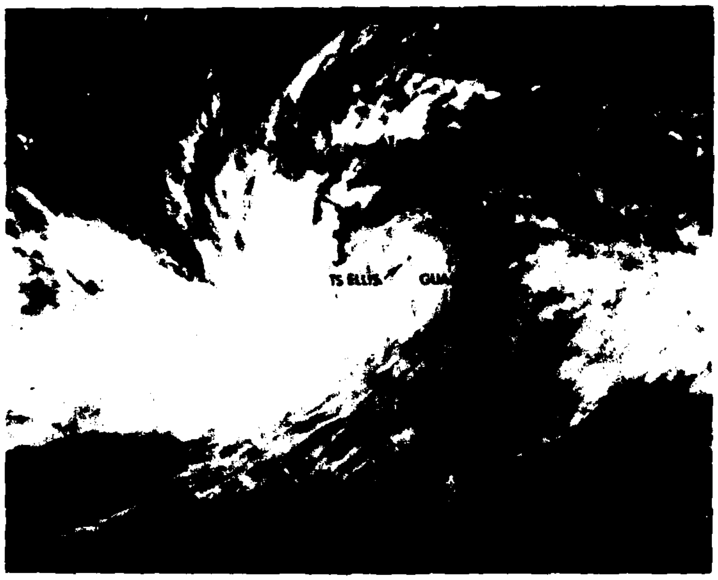


Figure 3-14-1. As an intense tropical storm, Ellis was exhibiting a strong southwest upper-level outflow pattern during a period when a banding-type eye was forming. 200510Z August (NOAA 7 visual imagery).

Figure 3-14-2. Typhoon Ellis, with strong upper-level outflow to the east and the southwest, was nearing a peak intensity of 125 kt (64 m/sec) at 221730Z August (NOAA 7 infrared imagery).

aircraft and satellite data supported an intensity greater than minimum typhoon strength (64 kt (33 m/sec)). In the following days, Ellis continued to develop rapidly, passing 100 kt (51 m/sec) intensity on 22 August and peaking at 125 kt (64 m/sec) on 23 August. Figure 3-14-2 shows Ellis just seven hours prior to reaching its maximum intensity.

By 230000Z, significant height falls were evident in the mid-tropospheric levels along the Ryukyu Islands, northwest of Ellis. The mid-latitude trough which had previously influenced Ellis's north-westward track was moving into the Yellow Sea. A day earlier, Ellis had shifted to a north-northwestward track as the subtropical ridge continued to weaken south of Japan. Interestingly, the 14 warnings issued from 221800Z to 260000Z consistently identified Ellis track within 30 nm (56 km) of the eventual best track up to 29N. During this period, both the analyses and numerical forecast fields maintained a very good relationship between the mid-latitude trough near Korea and the subtropical ridge, east of Japan.

As Ellis moved east of Okinawa on 25 August (Figure 3-14-3) its movement shifted toward the north. As early as 240000Z, JTWC forecasts began to anticipate this movement

Figure 3-14-3. Typhoon Ellis, located 140 nm (259 km) east of Okinawa, was approaching the mid-latitude westerlies and subsequent acceleration toward the north. 250551Z August (NOAA 7 visual imagery).

as well as significant acceleration as Ellis approached 28N, based on guidance from the Typhoon Acceleration Prediction Technique (TAPT) (Weir, 1982). Unfortunately Ellis slowed to 7 kt (13 km/hr) while approaching 28N and the early acceleration forecasts became premature in the timing of the initial acceleration. However, as Ellis crossed 28N, the predicted acceleration occurred and the speeds attained were very close to those predicted by TAPT.

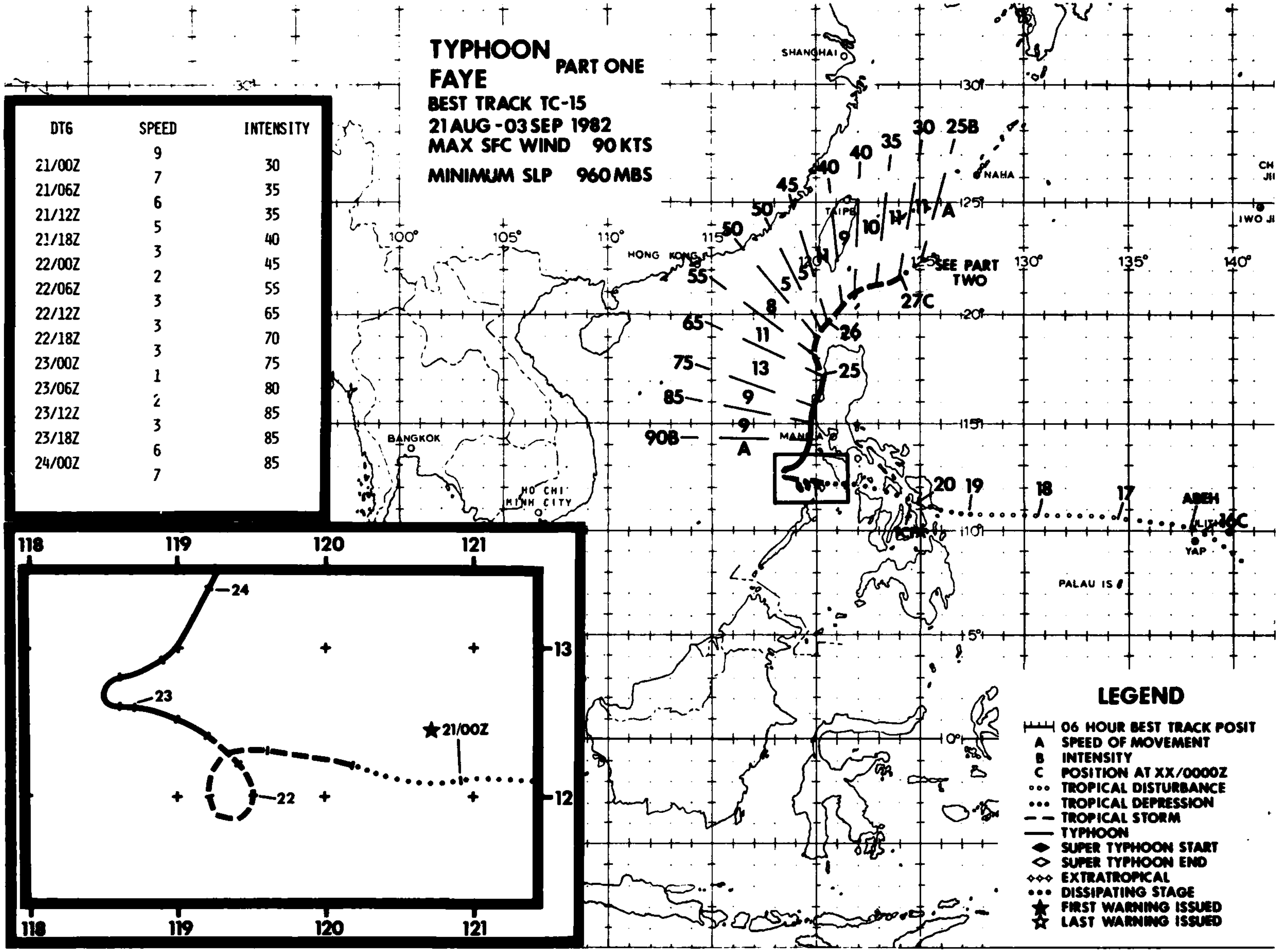
Once the acceleration was underway, Ellis commenced a more rapid weakening trend as the combined effects of increasing vertical wind shear and interaction with the topography of Kyushu, Skikoku and western Honshu reduced Ellis to an estimated 45 kt (23 m/sec) intensity as it entered the Sea of Japan.

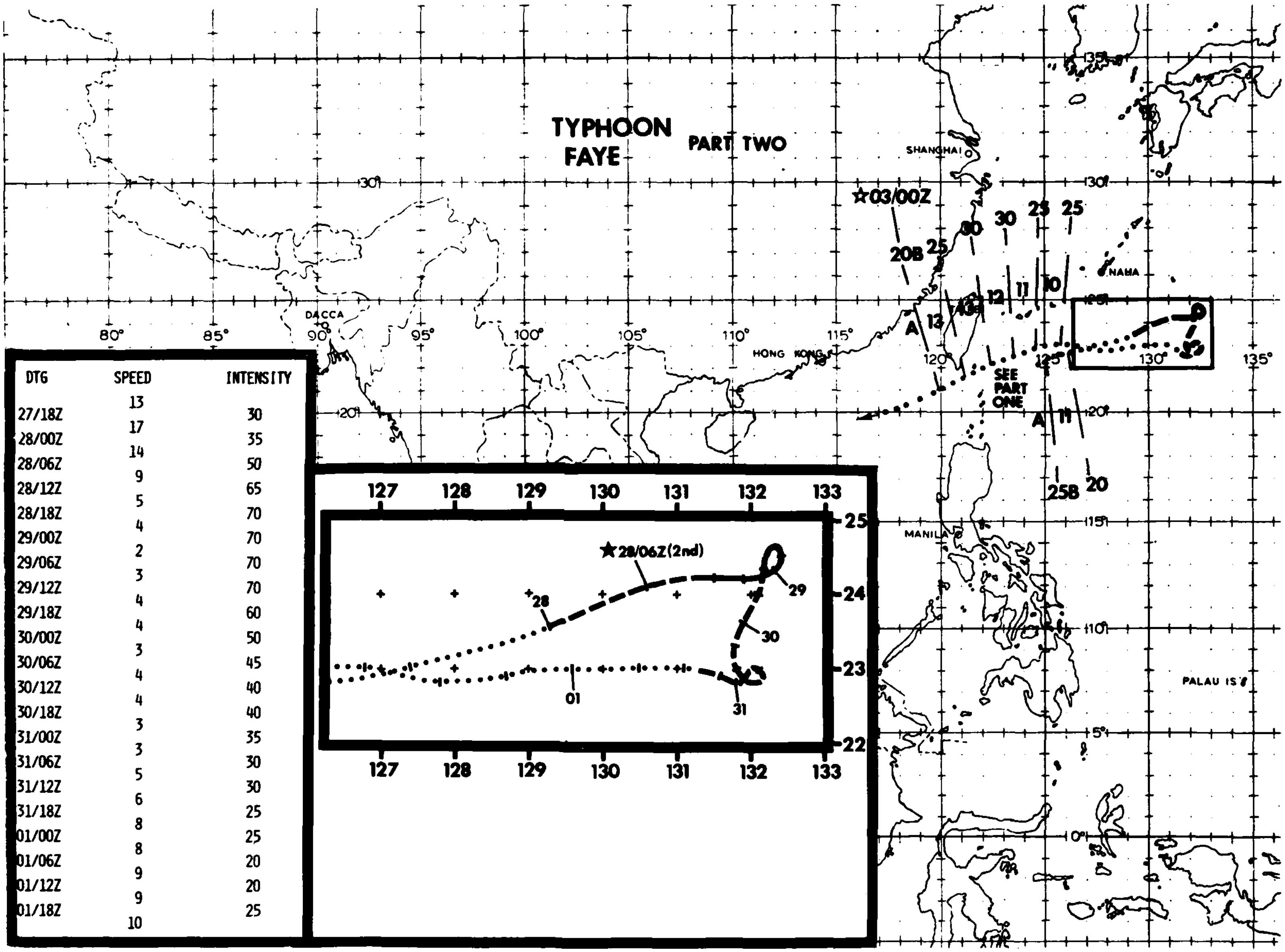
Ellis moved toward the north-northeast on 26 August and passed along Kyushu's eastern coastline and then just west of Hiroshima on 27 August. This jog to the north-northeast was costly for the region, as torrential rains (as much as 28 inches (71 cm) in 24 hours), flooding, landslides, and high winds brought much of southwestern Japan to a virtual standstill. Having left muc[illegible] of its fury behind, Ellis entered th[illegible] of Japan on 27 August and rapidly trans[illegible]ed into an extratropical low pressure sy[illegible] which would later move northwestward, passing 120 nm (222 km) west of Vladivostok, USSR.

TYPHOON FAYE PART ONE

BEST TRACK TC-15
21 AUG - 03 SEP 1982
MAX SFC WIND 90 KTS
MINIMUM SLP 960 MBS

DTG	SPEED	INTENSITY
	9	
21/00Z		30
	7	
21/06Z		35
	6	
21/12Z		35
	5	
21/18Z		40
	3	
22/00Z		45
	2	
22/06Z		55
	3	
22/12Z		65
	3	
22/18Z		70
	3	
23/00Z		75
	1	
23/06Z		80
	2	
23/12Z		85
	3	
23/18Z		85
	6	
24/00Z		85
	7	





DTG	SPEED	INTENSITY
	13	
27/18Z		30
	17	
28/00Z		35
	14	
28/06Z		50
	9	
28/12Z		65
	5	
28/18Z		70
	4	
29/00Z		70
	2	
29/06Z		70
	3	
29/12Z		70
	4	
29/18Z		60
	4	
30/00Z		50
	3	
30/06Z		45
	4	
30/12Z		40
	4	
30/18Z		40
	3	
31/00Z		35
	3	
31/06Z		30
	5	
31/12Z		30
	6	
31/18Z		25
	8	
01/00Z		25
	8	
01/06Z		20
	9	
01/12Z		20
	9	
01/18Z		25
	10	

Typhoon Faye (15) proved to be one of the more difficult tropical cyclones to forecast during the 1982 season (Figure 3-15-1). With forecast errors of 142, 384, and 629 nm (263, 711, and 1182 km) for 24, 48, and 72 hours, respectively, the forecast history for Typhoon Faye is a good example of what can happen when there is confusion in understanding the effect that the large-scale flow field and other larger tropical cyclones can have on a very small but intense cyclone. In this report the life history of Typhoon Faye is depicted in table form with seven segments (Table 3-15-1). For each segment, key events along with the basic forecast philosophy and prognostic reasoning are described. A brief post-analysis description is then presented in order to compare the actual events of the tropical cyclone and the synoptic situation. In this presentation it will be evident how a basically sound and logical forecast can go astray when all the "facts" are not completely understood. Furthermore, an attempt has been made in this table to describe for the reader the basic forecast/thought process at the JTWC. Figures 3-15-2 to 3-15-7 depict several events along Typhoon Faye's track.

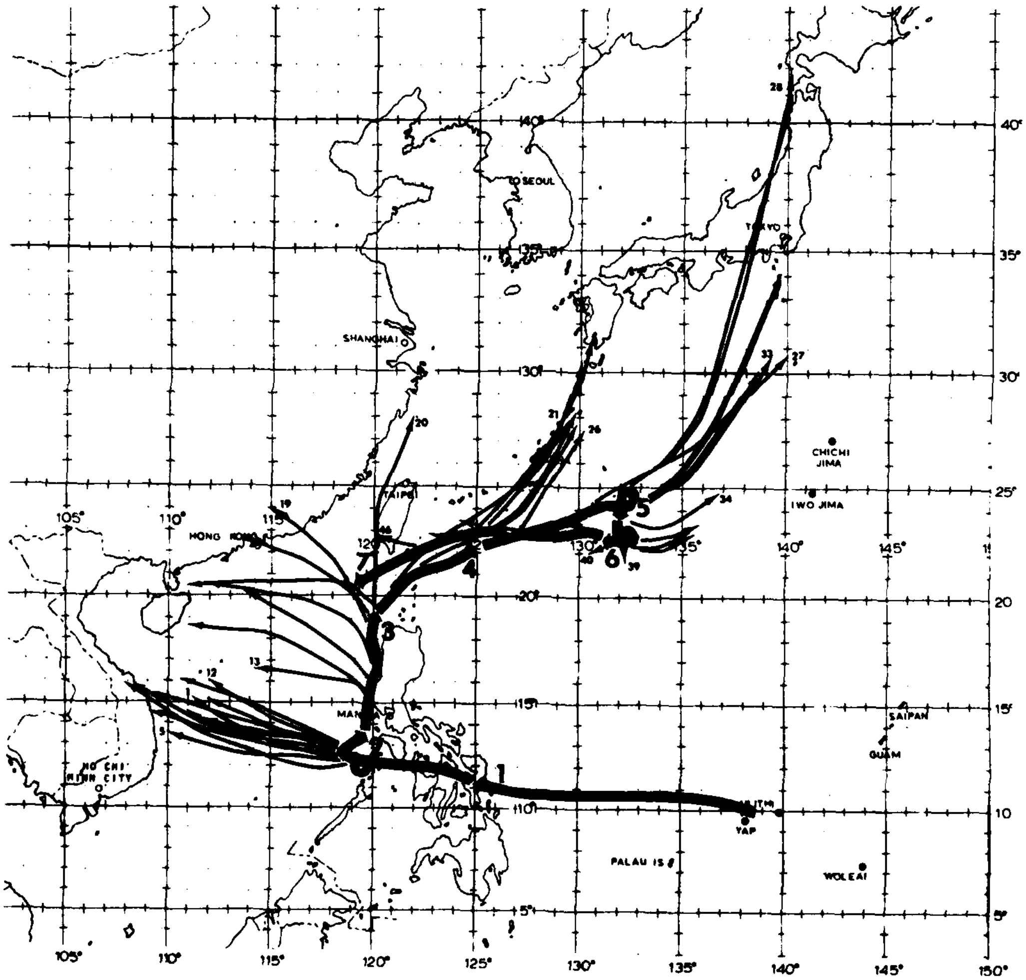


Figure 3-15-1. JTWC Windshield-wiper Chart. This chart depicts the forecast track for each warning issued for Faye. Ideally, in a well-handled forecast situation, there is not a "windshield-wiper" (back and forth) effect but a superposition of one forecast track upon another. Forecast segments will be described in Table 3-15-1.

TABLE 3-15-1

Segment	Time Period (Warnings) *Events	Prognostic Reasoning	Post-analysis Discussion
1	16/00Z - 20/00Z Aug (none) *Weak disturbance moves westward in the Philippine Sea toward the southern Philippines *Monitoring disturbance for indication of convective development	Although an exposed low-level circulation could be identified on satellite imagery as well as on synoptic data, little development was expected due to the proximity of the Philippines and the dominance of the flow pattern around Typhoon Ellis (14) near Guam.	Little difference from prog reasoning. An upper-level anticyclone did develop over the area when an upper trough moved between the system and Ellis; however, convection remained unorganized due to orographic influences from the Philippines.
2	20/00Z - 24/00Z Aug (#1 - #12) *System organizes in the South China Sea *Tropical Cyclone Formation Alert at 200203Z *1st warning at 210000Z in South China Sea *Upgrading to tropical storm status at 210600Z *Upgrading to typhoon status at 221200Z	**Movement**: Subtropical ridge in the vicinity of Hong Kong was forecast by the FNOC models to persist and strengthen during the forecast period. This would cause the system to slowly increase its forward speed toward the west-northwest. All objective aids predicted a west to northwest movement. **Intensification**: Dominance of both the upper- and lower-level flow by Ellis in the Philippine Sea, as well as slight northerly shear from the 200 mb ridge over China, was expected to prevent much intensification.	**Movement**: The dominance of Ellis, as well as the slow encroachment of a frontal zone from central China, prevented much building of the ridge over Hong Kong resulting in weak steering flow near Faye - especially in the lower layers. Faye showed little trend in movement until a frontal/shear zone reached southeastern China on 23-24 Aug (height falls were seen at 500 and 700 mb throughout region). **Intensification**: Although the adverse vertical shear had an effect on the cyclone, it resulted in a small, restricted system rather than a weak one. A small TUTT cell which was analyzed near Hai-nan Island on 22 Aug appeared to aid Faye's upper-level outflow toward the northeast.
3	24/00Z - 25/18Z Aug (#13 - #19) *System continues northward *System reaches greatest strength (90 kt (46 m/sec)) at 240600Z *System reaches Luzon at 241800Z with significant damage to Wallace Air Station at 242200Z with gusts up to 100 kt (51 m/sec) *Downgrading to tropical storm status at 250000Z	**Movement**: A persistent northward movement was expected during the initial 24 hours with a more climatological northwestward track in the outlook period. Although the daily analysis indicated that the subtropical ridge over China was moving north and weakening, FNOC prog series continued to call for a gradual strengthening of the ridge with time. Further support of this prognosis was seen in the expected quick movement of Ellis toward the north. Since Ellis was dominating the subtropical regions between 20-30N, its acceleration to the north and out of the subtropics, would allow for the eventual reintensification of the ridge. Finally, a forecast of westward movement continued to be predicted because of two primary reasons: the hesitation to break from the forecast philosophy maintained through the first 19 forecasts and the almost total lack of climatological tracks eastward of the South China Sea. **Intensification**: Little change from the forecast reasoning in Segment 2. Although northeasterly vertical shear from Ellis continued to dominate, it was now generally thought that Faye would remain strong in spite of the adverse synoptic environment. Only after Faye made landfall on Luzon was a gradual weakening trend predicted.	**Movement**: Inspite of predictions to the contrary by the FNOC prog series, the ridge over southern China continued to retreat northward and weaken as strong troughing dominated the region between Ellis and Faye. This resulted in an almost due northward movement of Faye. Toward the end of this period, low- to mid-level westerly flow began to strengthen in the Luzon Strait while Ellis slowed its forward speed to 7 kt (13 km/hr) just east of Okinawa. **Intensification**: Faye continued to intensify until its circulation pattern began to interact with the mountainous terrain of western Luzon. Once landfall was made at 241800Z, a steady deterioration was observed as Faye had trouble maintaining good vertical alignment. The cause of this poor alignment appeared to come equally from the orographic effects of Luzon and the strong vertical shear north of Luzon initiated by Ellis's outflow pattern.

Segment	Time Period (Warnings) *Events	Prognostic Reasoning	Post-analysis Discussion
4	25/18Z - 27/06Z Aug (#20 - #26) *System begins to move northeastward at 251800Z *Initial final warning at 270600Z	Movement: Once Faye began to move northeastward at 11 kt (20 km/hr) along the low-level flow induced by Ellis, it was assumed that it would continue this motion until it reached Japan as FNOC prog series maintained a trough in this region throughout the period. Intensification: It was believed that if Faye could maintain its vortex, slow reintensification was possible once the strong shear from Ellis subsided. This scenario was abandoned for gradual dissipation when aircraft missions continued to show a weakening trend.	Movement: Initial northeast movement was well predicted; however, toward the end of the period the low-level flow began to split in the vicinity of Faye with a portion of the flow moving northward into the trough and the other portion moving east-southeastward toward the newly developed Tropical Storm Gordon (16). Faye began to follow this more eastward track near the end of the period. Intensification: Upper-level shear from the remains of Ellis continued to hamper Faye's efforts to reintensify. This adverse environmental effect reduced Faye to an exposed low-level circulation with only a few isolated convective cells.
5	27/06Z - 29/18Z Aug (#27 - #33) *System continues on a east-northeastward track *System reintensifies to tropical storm status at 280000Z *JTWC resumes warning status at 280600Z *System intensifies to typhoon strength at 280900Z *System weakens to tropical storm strength at 291500Z	Movement: After Ellis moved north of Japan, the long wave trough was positioned over western Japan and the Sea of Japan. Since FNOC Progs predicted little change in pattern, a forecast track toward the northeast appeared the most logical. This was also supported by the CYCLOPS steering aids and the dynamic models. The JTWC TAPT technique - which keys on the 200 mb flow - predicted rapid acceleration toward the northeast north of 25N was likely. The direction of movement was predicted along the 500 mb flow. Intensification: Wind intensities were forecast based on persistence in the near term and gradual weakening with increasing latitude in the outlook period.	Movement: Although the upper trough remained over Japan as predicted, Faye perhaps due to its small size, failed to entrain into this flow or move north of 25N. Instead it appeared to be trapped within the low-level trough between Faye and Gordon and after 281800Z it became quasi-stationary. This resulted in very large forecast errors for this period. Intensification: Once Faye moved out of the strong shearing environment, rapid intensification occurred. Faye went from a weak tropical depression to a typhoon in 27 hours. This reintensification was not well predicted nor was its extremely small size (smaller than that observed in the South China Sea). Aircraft at this time measured maximum surface winds of 70 kt (36 m/sec) out to only 10 nm (19 km) from the center and 30 kt (15 m/sec) winds out to 60 nm (111 km).

Figure 3-15-2. (Segment 1) Faye, as a tropical depression, crossing the southern Philippines. Although wind speeds were generally less than 25 kt (13 m/sec), widespread damage to property and agriculture was reported by Philippine newspapers due to flooding. 200652Z August (NOAA 7 visual imagery).

Segment	Time Period (Warnings) *Events	Prognostic Reasoning	Post-analysis Discussion
6	29/18Z - 31/06Z Aug (#34 - #39) *System shows little trend in movement and continues to weaken	Movement: Since it was apparent that Faye was not responding to the mid-latitude trough to the north, it was forecast to move eastward with the low-level flow directed toward Typhoon Gordon (16). Initially, movement was expected to be slow since the analysis fields indicated weak steering flow within the trough between Faye and Gordon. Once Gordon moved north, stronger westerlies were expected to accelerate Faye's low-level circulation eastward. Intensification: Dissipation was expected within 24 to 48 hours due to the proximity of Faye to Gordon's strong upper-level outflow pattern.	Movement: During this period, Gordon failed to maintain a steady northward motion. Instead, Gordon slowed its forward speed to 5 kt (9 km/hr). This, in turn, resulted in extremely weak steering flow at all levels around Faye. Toward the end of the period, a ridging pattern began developing over western Japan resulting in a slight increase in northerly and then northeasterly flow. Faye began to move slowly southwestward in response to this flow. Intensification: Although Faye continued to weaken as predicted, the cause was not from Gordon's upper-level wind pattern but from the movement of an upper trough from China to a position over Faye. This resulted in Faye being stripped of its convection, leaving an exposed low-level circulation.
7	31/06Z Aug - 03/06Z Sep (#40 - #50) *System weakens to a tropical depression at 310600Z *System drifts westward for three days as an exposed low-level circulation *Final warning issued by JTWC for Faye at 030000Z *System dissipates in the South China Sea at 030600Z	Movement: With the ridge well established north of the system and over western Japan, a predicted westward movement appeared to be best. Intensification: Aircraft reconaissance indicated that Faye's central pressure had risen to 999 mb and so each warning during this period predicted dissipation within 24 hours.	Movement: Forecast track was fairly accurate although Faye's increase in forward speed to 13 kt (24 km/hr) was not anticipated. Intensification: Although its wind intensities were only 20-30 kt (10-15 m/sec), Faye managed to survive as a low-level circulation much longer than predicted. Final dissipation did not occur until Faye's exposed low-level circulation became entrained into the monsoon circulation that was to become Typhoon Hope (17) in the South China Sea.

Figure 3-15-3. (Segment 3) The "eye" of Typhoon Faye as seen by radar 66 nm (122 km) southwest of Subic Bay at 240358Z August. (Photograph courtesy of NOCF, Cubi Pt, Republic of the Philippines)

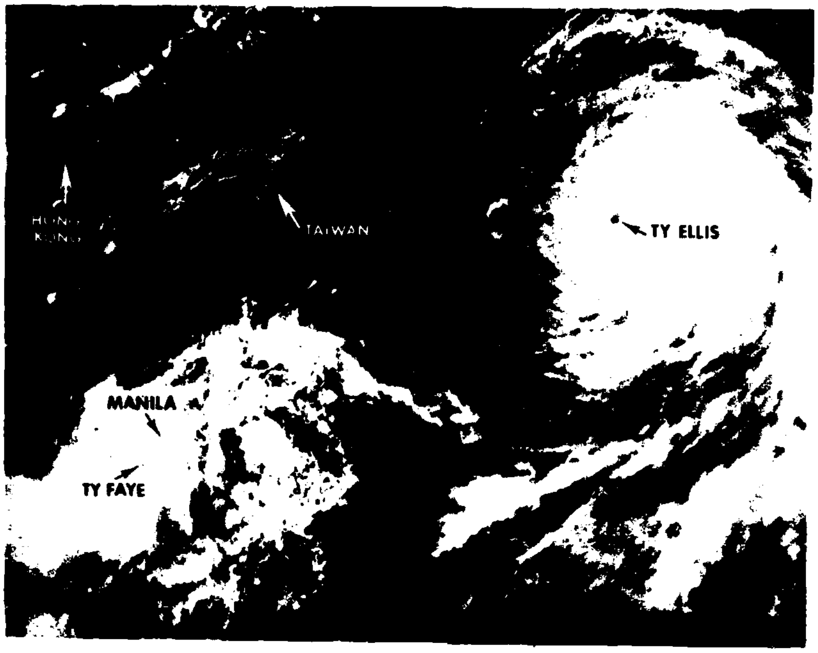


Figure 3-15-4. (Segment 3) Typhoon Faye at full strength, 90 kt (46 m/sec), just south of Luzon. The much larger Typhoon Ellis, 110 kt (57 m/sec), can be seen 925 nm (1713 km) northeast of Faye. 240603Z August (NOAA 7 visual imagery)

Figure 3-15-5. (Segment 4) Tropical Storm Faye just south of Taiwan weakening rapidly at 260539Z August as it moves under the strong upper-level outflow of Typhoon Ellis. (NOAA 7 visual imagery)

Figure 3-15-6. (Segment 6) Tropical Storm Faye, 50 kt (26 m/sec), once again being dwarfed by another tropical cyclone (Typhoon Gordon, 100 kt (51 m/sec)) at 300451Z August (NOAA 7 visual imagery)

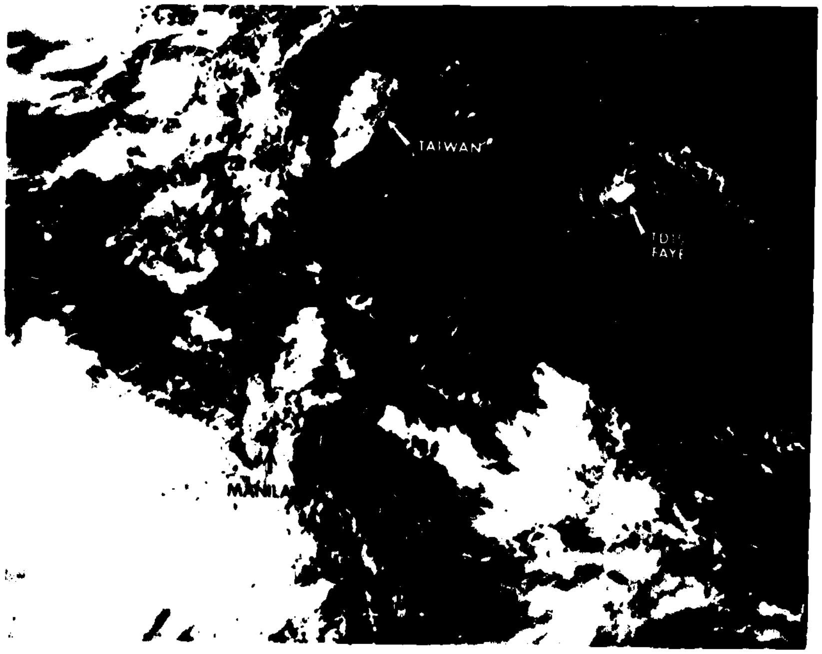
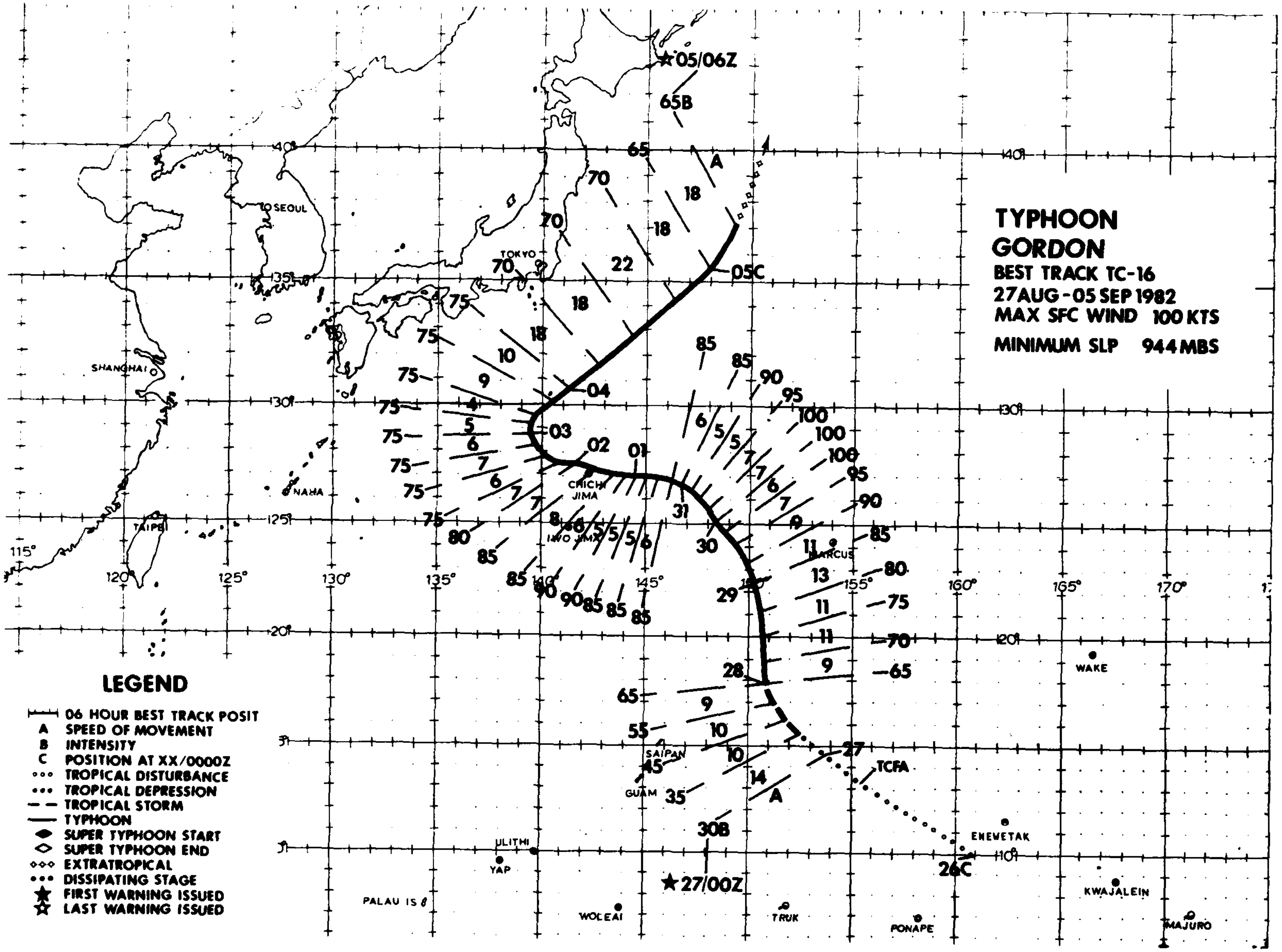


Figure 3-15-7. (Segment 7) An exposed low-level circulation can be seen just east of Taiwan as the remains of Typhoon Faye at 010608Z September. This weak circulation persisted for over three days. (NOAA 7 visual imagery)


TYPHOON
GORDON
BEST TRACK TC-16
27AUG-05 SEP 1982
MAX SFC WIND 100 KTS
MINIMUM SLP 944 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
05/06Z
65B
05C
27/00Z
30B
26C
TCFA
SEOUL
SHANGHAI
TAIPEI
NAHA
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO

Typhoon Gordon developed rapidly from a disturbance which was initially detected while it was embedded in an elongated monsoon trough along 8N between 145E and 175E. Within 48 hours of its initial detection, Gordon reached typhoon strength and eventually proved to be one of the most difficult typhoons of the season for JTWC forecasters.

On 25 August, a surface circulation was detected near 8N 163E associated with an area of strong, yet unorganized convection. During the ensuing 24 hours little increase in convective organization was noted on satellite imagery; however, an upper-tropospheric pattern existed nearby that was conducive for further development. Analysis data indicated that outflow channels were readily available via an upper-level anticyclone centered near 10N 167E, further enhanced by a tropical upper-tropospheric trough (TUTT) north of Guam.

Rapid development did not occur until the upper-level anticyclone moved over the surface circulation. A TUTT cell located northwest of the disturbance enabled outflow channels to remain open to all quadrants and resulted in a significant increase in convection on 26 August. A Tropical Cyclone Formation Alert (TCFA) was issued at 261500Z during this burst in convective activity and organization. Synoptic data from Truk Atoll (WMO 91334) and Ponape (WMO 91348) at 261200Z also indicated intensification was occurring as gradient level winds increased to near 30 kt (15 m/sec) at both reporting stations.

A reconnaissance aircraft investigative mission at 262347Z was able to fix a circulation center near 14.5N 154E with associated surface winds of 30 kt (15 m/sec) and a 1001 mb sea level pressure. These data preceded the issuance of the first warning for Tropical Depression 16 at 270100Z. One day later, at 272335Z, reconnaissance aircraft data showed Gordon's central sea level pressure had dropped to 977 mb and surface winds of 65 kt (33 m/sec) were observed in the north semicircle. During this period of intensification, Gordon was upgraded to tropical storm status at 270600Z and typhoon status at 280000Z based on reported aircraft data and steadily increasing cloud system organization. At 291800Z, four days after initial detection, Gordon's rapid intensification ended at 100 kt (51 m/sec) (See Figure 3-16-1).

The forecasts issued by JTWC during Gordon's developing stages anticipated a northwestward movement toward a weakness in the subtropical ridge located near 20N 150E. These forecasts anticipated recurvature to occur as Gordon moved north of the ridge axis along 23N and came under the influence of an advancing mid-latitude trough. In response to this synoptic situation, Gordon's forward speed slowed as it approached the ridge axis on 28 August; however, the mid-latitude trough continued its eastward movement and by 29 August, its effects on Gordon's movement were no longer evident. Following the passage of this trough, the subtropical ridge was re-established north of Gordon and in response, Gordon resumed a northwestward track along the ridge's southwestern periphery. Forecasts issued on 29 and 30 August reflected Gordon's continued northwestward movement followed by a northward movement and acceleration toward Japan.

By 31 August, a different forecast scenario was gaining strength. At 310000Z, 500 mb and 700 mb height rises were observed over southern Honshu and north of Gordon, indicating the approaching short wave trough was weakening or moving more northeastward than previously forecast. During this period, Gordon, with 90 kt (46 m/sec) surface winds, was advecting large amounts of warm, moist air from the tropics and thereby strengthening the ridge to the northeast. This strengthening of the ridge, combined with changes in the short wave trough, forced Gordon toward

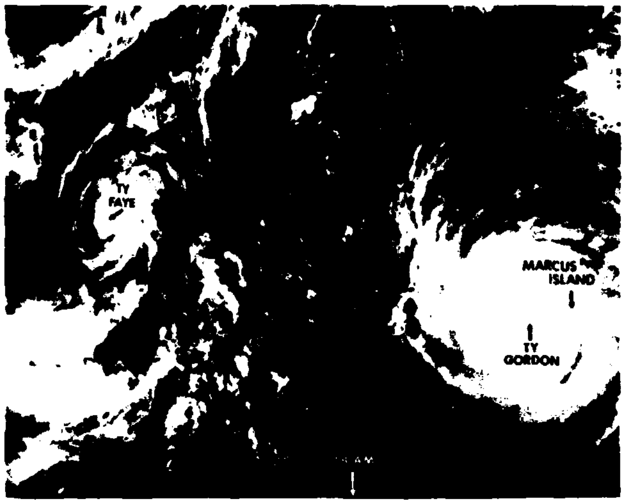


Figure 3-16-1. Typhoon Gordon near maximum intensity of 100 kt (51 m/sec) 640 nm (1185 km) northeast of Guam. Typhoon Faye is also seen in this picture south of Okinawa. 290502Z August (NOAA 7 visual imagery).

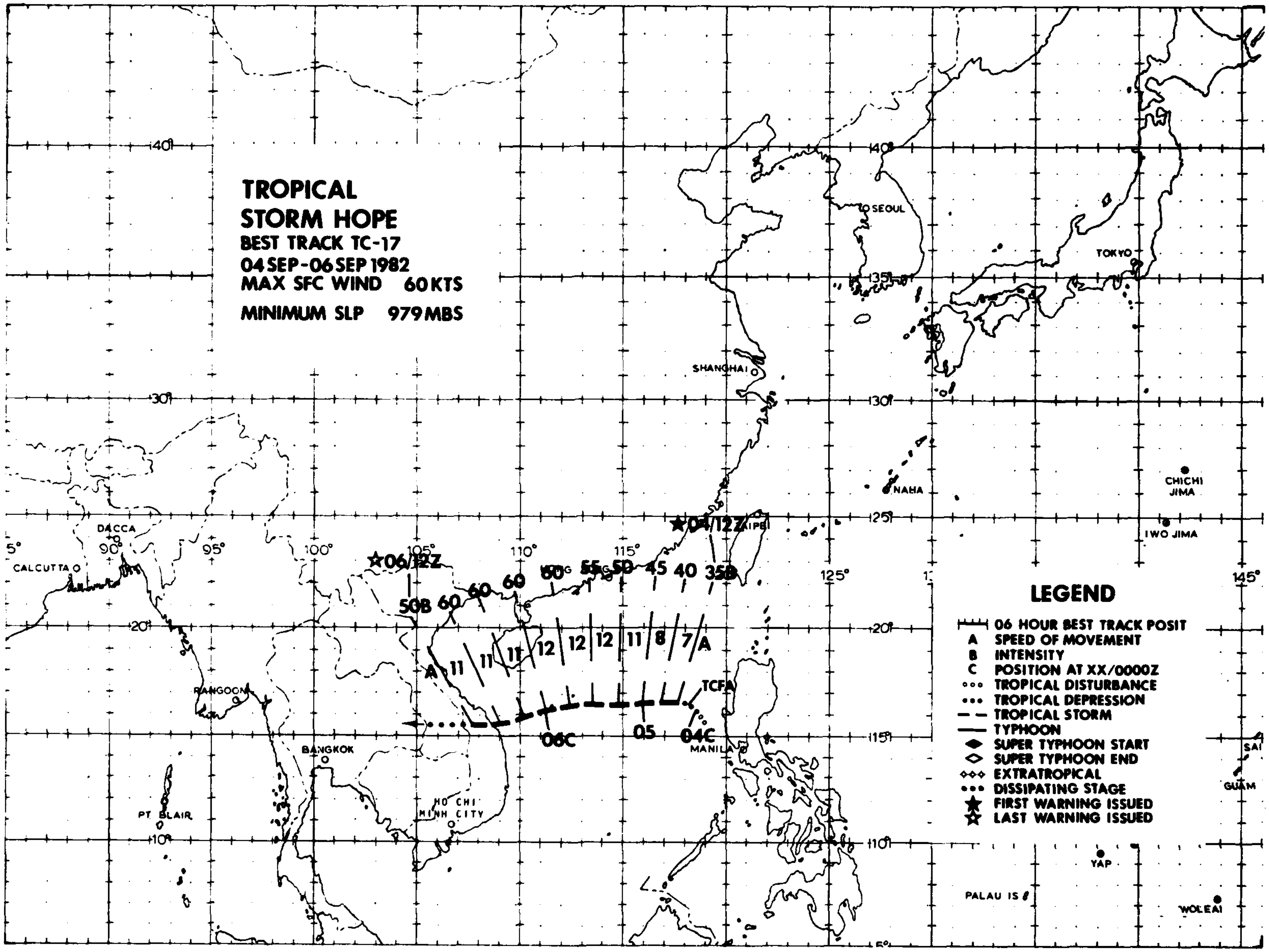
a more westward track which was maintained until late on 2 September.

In response to numerical forecast fields which showed a low- to mid-level ridge near Korea building eastward over Japan, JTWC forecasts on 2 September began forecasting a continued westward movement along the southern periphery of the two ridges. By 030000Z, a conflicting forecast scenario began to develop. It was observed that 500 mb and 700 mb heights were falling over southern Honshu, indicating that the short wave trough, located over Hokkaido, was deepening once again. However, the numerical forecast fields provided by Fleet Numerical Oceanography Command (FNOC), Monterey, CA, did not reflect this tendency and continued to build the ridge behind the short wave trough and to the north of Gordon's track. At this time, two opposing forecasts were considered possible: one reflecting the westward track below the ridge; the other, indicating a sharp recurvature and acceleration toward the northeast in response to the deepening trough. JTWC chose to maintain the westward prediction as the FNOC forecast fields appeared to be a meteorologically sound solution to the synoptic situation. Concurrently, an intensive meteorological watch was instituted whereby conventional analysis data and satellite imagery were closely monitored for indication of any changes which would mandate a change from the westward-moving forecast scenario.

On 3 September, Gordon slowed to 4 kt (7 km/hr) from 7 kt (13 km/hr) and took an increasingly more northward course. This movement, combined with the continued 500 mb and 700 mb height falls over Honshu prompted JTWC to abandon the westward forecast at 031200Z, and adopt a forecast toward sharp recurvature and acceleration to the northeast.

Subsequent to the change in the JTWC forecast toward recurvature, the FNOC forecast fields, produced from the 031200Z data base, changed significantly and supported the recurvature scenario. Had the numerical forecast series indicated this trend earlier and not persisted in building the low- to mid-level ridge eastward from Korea, the recurvature track would have been adopted much earlier or perhaps not even abandoned on 2 September. This forecast situation emphasizes the difficulty in issuing credible forecasts when there exists a conflict between the observed short-term changes in the analysis data and the numerically forecast changes beyond the analysis period. There are no easy answers in there situations and unfortunately, in similar future forecast situations, JTWC and its customers may well have to deal with alternating guidance from both analysis and forecast fields.

On 3 and 4 September, Gordon did sharply recurve to the east-northeast as it became embedded in the mid-latitude westerlies along the southeastern periphery of the short wave trough. A fairly rapid accleration to 22 kt (41 km/hr) was observed prior to extratropical transition near 37N at 050600Z. As Gordon recurved, it passed 260 nm (482 km) southeast of Tokyo. The U.S. Naval Oceanography Command Facility at Yokosuka, Japan, reported maximum sustained winds of 32 kt (16 m/sec) with a maximum gust of 44 kt (23 m/sec) during the period, 3 to 4 September. Fortunately, despite some difficult forecast situations, Gordon did not strike any major land mass and there was no significant damage to military or civilian interests in Japan.


TROPICAL
STORM HOPE
BEST TRACK TC-17
04 SEP-06 SEP 1982
MAX SFC WIND 60 KTS
MINIMUM SLP 979 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
04/12Z
06/12Z
TCFA
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
DACCA
CALCUTTA
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
PT BLAIR
YAP
PALAU IS
WOLEAI
GUAM

TROPICAL STORM HOPE (17)

Tropical Storm Hope developed from a monsoon depression which formed on 3 September along the northern edge of a strong southwest monsoon flow (25 to 30 kt (13 to 15 m/sec)) that was present over the southern portion of the South China Sea. During the formative stages of this rapidly deepening monsoon depression, shipboard synoptic observations provided essential data which enabled the JTWC to closely monitor the system's development.

At 040345Z, a Tropical Cyclone Formation Alert was issued for an area west of central Luzon when shipboard observations revealed surface pressures had dropped to at least 1002 mb near the depression's center. The 041200Z synoptic data, indicating improved organization in the low-level wind flow, prompted the first warning which was issued at 041500Z. In support of the first two warnings, satellite fix positions - based on a poorly-defined cloud signature - and surface observations did not correlate very well on the system's center. Thus, when a resources permitting aircraft reconnaissance mission at 042357Z located Hope well southwest of the previous warning position, with maximum winds of 45 kt (23 m/sec) and a 994 mb central sea level pressure, the tropical cyclone was relocated and upgraded to tropical storm status on the 050000Z warning.

During the first 30 hours in warning status, Hope intensified to a peak of 60 kt (31 m/sec) which was maintained until landfall. On 6 September, Hope slammed into the coast of Vietnam, 25 nm (46 km) south of Da Nang, and subsequently dissipated over the mountainous terrain of Vietnam and Laos. Accompanying Hope's demise over Southeast Asia, widespread flooding was reported in Vietnam and northeastern Thailand, resulting in several thousand people fleeing their homes and extensive damage to the season's rice crop.

From the first warning, JTWC forecasts continued to anticipate that Hope would slow its forward movement, or move towards the west-northwest and slow. Hope, however, accelerated towards the west-southwest, paralleling the subtropical ridge axis to the north, and the expected forecast movement was never realized.

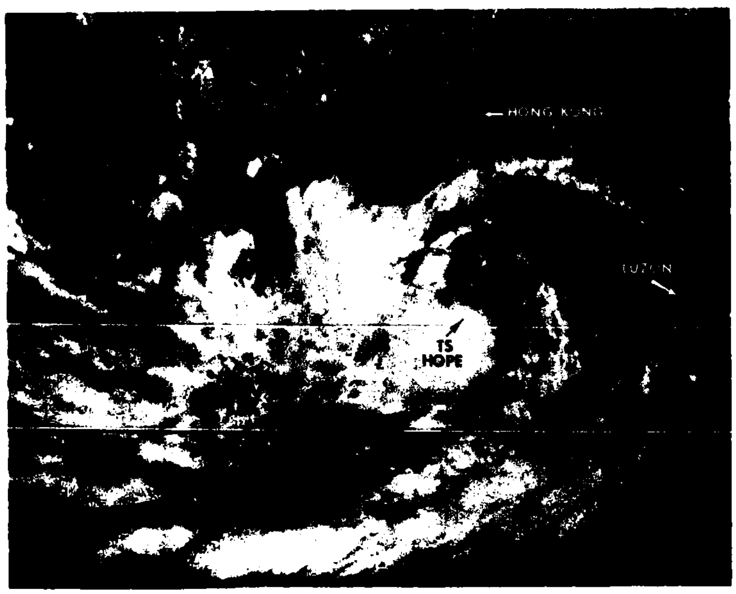
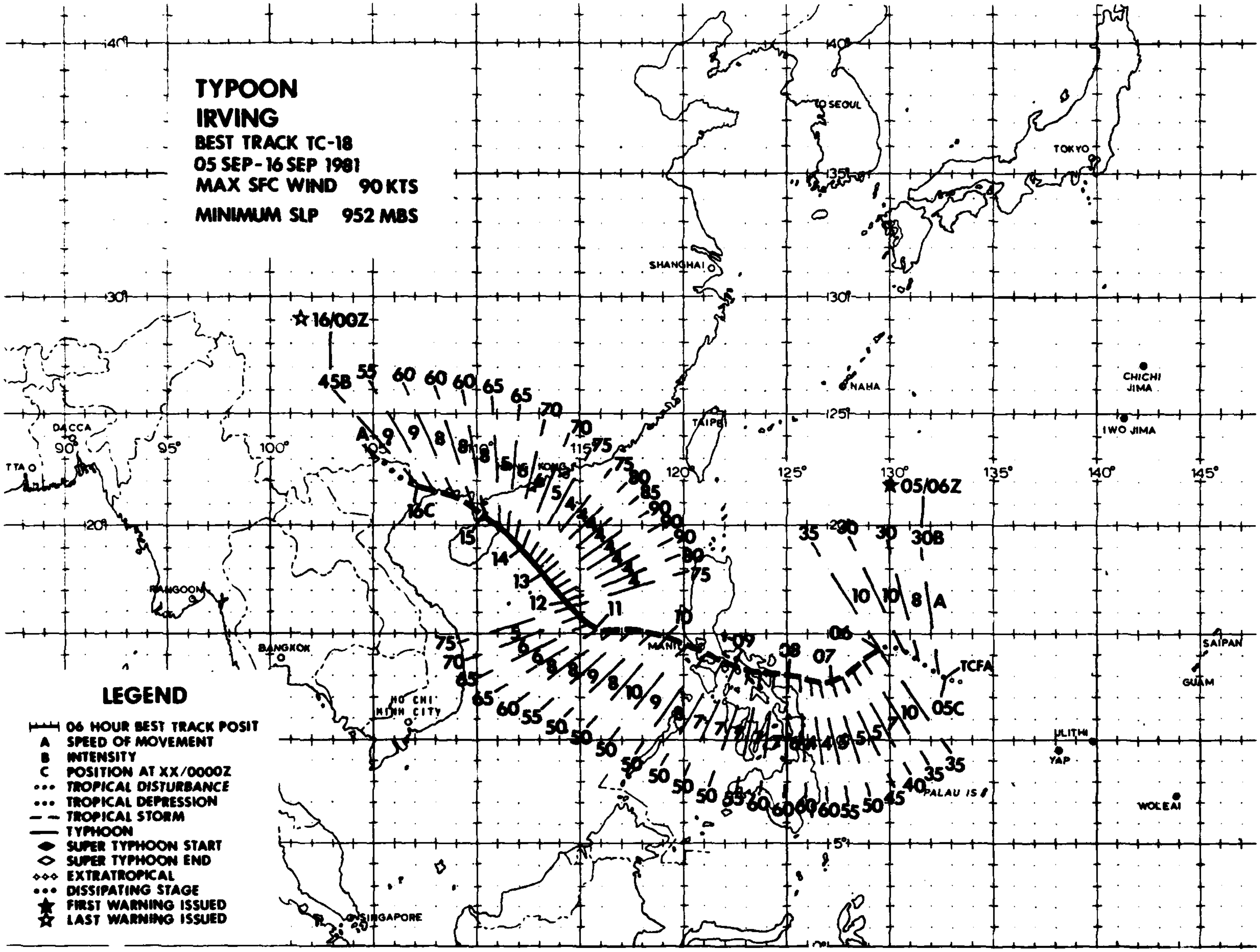


Figure 3-17-1. Tropical Storm Hope near 50 kt (26 m/sec) intensity in the central South China Sea. 050700Z September (NOAA 7 visual imagery).


TYPOON
IRVING
BEST TRACK TC-18
05 SEP-16 SEP 1981
MAX SFC WIND 90 KTS
MINIMUM SLP 952 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
16/00Z
05/06Z
TCFA
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
DACCA
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
SINGAPORE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
PALAU IS

Typhoon Irving developed within an area of unorganized convection associated with an active monsoon trough anchored south of Guam in early September. Surface pressures throughout the region between 125E to 165E and 8N to 13N were below 1004 mb, and the southwest monsoon flow averaged 20 kt (10 m/sec) over much of the region. By 040300Z, a low-level circulation was evident on visual satellite imagery near 11N 130E, although nearby convection had decreased during the preceding 12 hours. During this period, another tropical cyclone was developing in the monsoon trough near 12N 147E (Typhoon Judy (19)). The passage of Typhoon Gordon (16) east of Japan re-established a low-level easterly flow to the north of both of the developing systems; thus increasing the potential for further development.

As the circulation near 130E (Irving) developed, an increase in cloud organization was seen on satellite imagery which led to the issuance of a Tropical Cyclone Formation Alert at 050000Z. An immediate, abbreviated warning bulletin for Tropical Depression 18 was issued by JTWC at 050855Z, when reconnaissance aircraft closed off a surface circulation with observed winds near 30 kt (15 m/sec). Based on continued convective organization, Tropical Depression 18 was upgraded to Tropical Storm Irving at 051800Z.

Early in its development, Irving was characterized as an exposed low-level circulation center to the east of the most active convection region of the disturbance. Visual satellite imagery and aircraft reconnaissance data enabled JTWC to follow the surface center, rather than the upper-level (convective) center, as Irving moved across the Philippine Sea.

From 6 to 8 September Irving remained equatorward of a strengthening subtropical ridge and maintained a westward track across the Philippine Sea. Irving made landfall at 080900Z, on the southern tip of Luzon (Figure 3-18-1). Maximum winds at landfall were 60 kt (31 m/sec). Thereafter, Irving assumed a more northwestward path (of least resistance) through the Sibuyan Sea

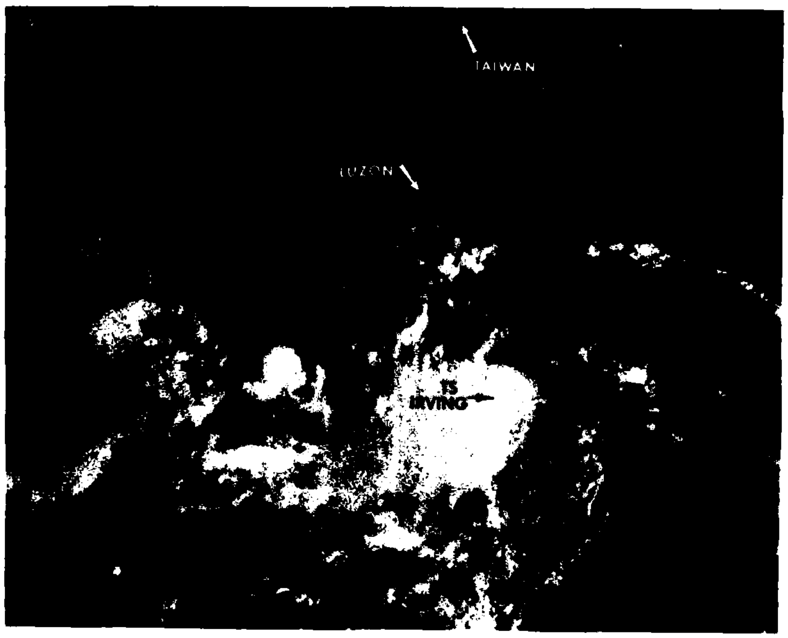


Figure 3-18-1. Tropical Storm Irving near landfall south of Luzon. 081616Z September (NOAA 7 visual imagery)

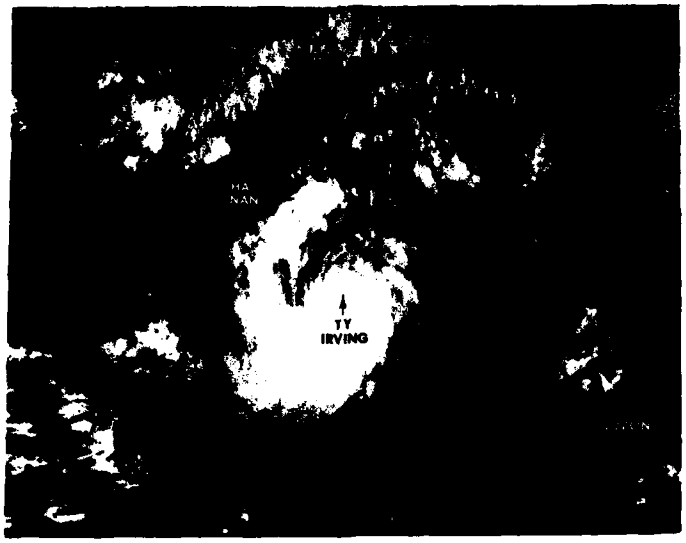


Figure 3-18-2. Typhoon Irving near maximum intensity in the South China Sea. 130706Z September (NOAA 7 visual imagery)

and remained over a marine pathway between the islands of the central Philippines. During this period, Irving maintained much of its intensity although some convective organization was lost. Irving entered the open waters of the South China Sea, 27 nm (50 km) southwest of Cubi Point Naval Air Station at 091700Z. NAS Cubi reported sustained winds of 46 kt (24 m/sec) with a peak gust of 64 kt (33 m/sec) during Irving's transit of the region.

As Irving moved into the South China Sea, a return to a more westward track and gradual intensification were forecast, with the subtropical ridge anticipated to maintain itself north of Irving's track throughout most of the period. A more northwestward track became probable based upon analyses of 500 and 700 mb heights at 110000Z that indicated height falls at both levels were occurring over China. Irving, sensing this developing weakness in the subtropical ridge, maintained

Figure 3-18-3. Typhoon Irving approaching mainland China. 150643Z September (NOAA 7 visual imagery)

a slow, northwestward movement until 141200Z, when a slight acceleration began. Aircraft reconnaissance at 120630Z reported a maximum observed surface wind of 90 kt (46 m/sec), well above the 50 to 65 kt (26 to 33 m/sec) range previously forecast. Figure 3-18-2 shows Irving near peak intensity. The aircraft data also indicated that Irving had a very tight circulation, with the radius of 50 kt (26 m/sec) winds within 60 nm (111 km) of the center during this period of maximum intensity. Radar observations, as well as synoptic reports from the Paracel Islands (WMO 59981 and 59985) were very useful in accurately determining Irving's position and intensity during the period 12-13 September when reconnaissance aircraft fix missions could no longer be flown.

On 15 September, as the system began to interact with Hai-nan Island and the coast of China, Irving was downgraded to tropical storm strength (Figure 3-18-3). Irving made landfall 110 nm (204 km) northeast of Hanoi at 151800Z, and thereafter rapidly dissipated over the mountainous area of Vietnam.

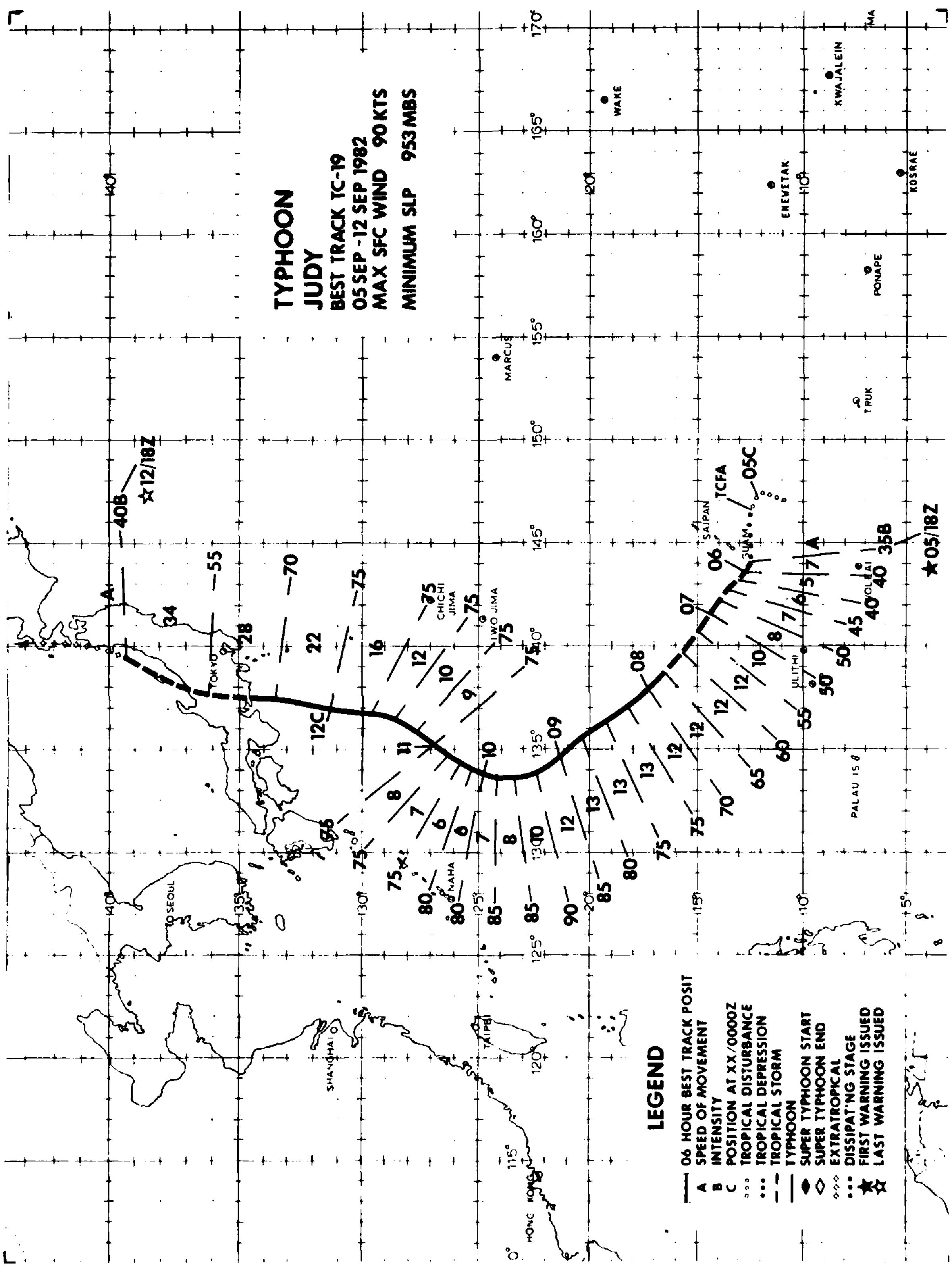

TYPHOON
JUDY
BEST TRACK TC-19
05 SEP - 12 SEP 1982
MAX SFC WIND 90 KTS
MINIMUM SLP 953 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SEOUL
SHANGHAI
TAIPEI
HONG KONG
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
KWAJALEIN
ENEWETAK
KOSRAE
PONAPE
TRUK
SAIPAN
GUAM
ULITHI
OLEAI
PALAU IS
TCFA
05C
35B
05/18Z
12/18Z
40B
12C

Figure 3-19-1. 050520Z September (NOAA 7 visual imagery).

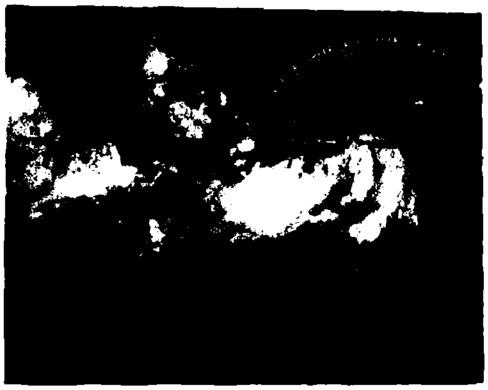


Figure 3-19-2. 060508Z September (NOAA 7 visual imagery).

Typhoon Judy, along with Typhoon Irving (18) developed within a very active monsoon trough that dominated the low-latitudes of the western North Pacific during the first week of September. At 041200Z, synoptic data indicated low-level winds were beginning to organize around the disturbances which later became Judy and Irving. This apparent organization prompted the reissuance of the Significant Tropical Weather Advisory (ABEH PGTW) at 041600Z which discussed each of these systems for the first time. The relatively continuous maximum cloud zone that spawned these two typhoons is shown in Figure 3-19-1, at about the time that a Tropical Cyclone Formation Alert was issued for Judy and the initial warning was issued for Tropical Depression 18 (Irving).

During the ensuing 24-hour period, Judy rapidly organized while Irving slowly intensified. It was during this period that satellite imagery showed the maximum cloud zone segmenting around the two systems (Figure 3-19-2). The first warning for Tropical Depression 19 was issued at 051600Z when satellite imagery indicated a progressive development of cloud features around the system. The first reconnaissance aircraft mission for Judy was conducted at 052239Z and reported 45 kt (23 m/sec) surface winds and a 994 mb minimum sea level pressure. Based on these data, Tropical Depression 19 was upgraded to Tropical Storm Judy on the 060000Z warning.

Initial forecasts for Judy anticipated a movement toward the west-northwest as the numerical forecast series built the subtropical ridge from 150E toward 130E along 25N. However, the subtropical ridge did not build from east to west but built northward along 150E instead. This change in ridge orientation, along with the eastward progression of a short wave trough over Asia, permitted Judy to track northwestward toward eventual recurvature east of Okinawa.

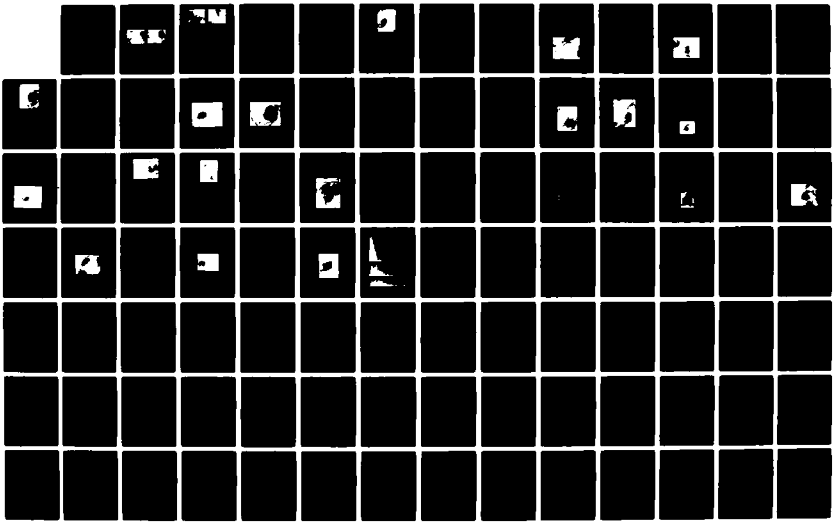
Figure 3-19-3. 090613Z September (NOAA 7 visual imagery).

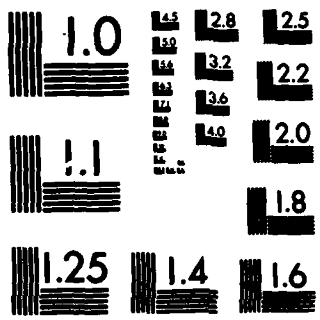
Figure 3-19-4. 091858Z September (NOAA 7 infrared imagery).

AD-A124 860 ANNUAL TROPICAL CYCLONE REPORT 1982(U) NAVAL OCEANOGRAPHY COMMAND CENTER/JOINT TYPHOON WARNING CENTER FPO SAN FRANCISCO 96630 1982

2/3

UNCLASSIFIED F/G 4/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

From 6 to 9 September, Judy developed at a fairly steady rate (15 to 20 kt (8 to 10 m/sec) per day) and reached a peak intensity of 90 kt (46 m/sec) on 9 September. This period of intensification was aided by a tropical upper-tropospheric trough (TUTT) that was located to the north and northwest of Judy through most of this period.

On 8 and 9 September, 200 mb data and satellite imageries suggested that Judy's upper-level circulation was moving into a region previously occupied by the TUTT. As depicted in Figure 3-19-3, the TUTT axis was contorted northward around the periphery of the advancing Judy. By 091858Z (Figure 3-19-4), satellite imagery revealed that the west quadrant was virtually devoid of deep-layer convection and Judy's center had expanded to more than 90 nm (167 km) in diameter. During this period, Judy exhibited a reversal in sea level pressure tendency and subsequent reintensification was not observed. Based on the interpretation of available data, it appears that at the mid- and upper-tropospheric levels, Judy may have ingested the remnants of the TUTT; and this entrainment of cooler air at these levels may have accounted for the changes in Judy's intensity trend and the resultant satellite signature that were observed on 9 September.

Prior to 081800Z, JTWC forecast tracks predicted that Judy would progress slowly toward the north in the 48- to 72-hour period with a close approach to Okinawa expected. However, with the issuance of warning number 13 at 081800Z, a significant change toward the north and recurvature toward eastern Honshu was forecast. This change in the forecast was prompted by the 081200Z 500 mb and 200 mb analyses data which showed a deeper penetration of a mid-latitude trough, south of Korea, than was previously anticipated.

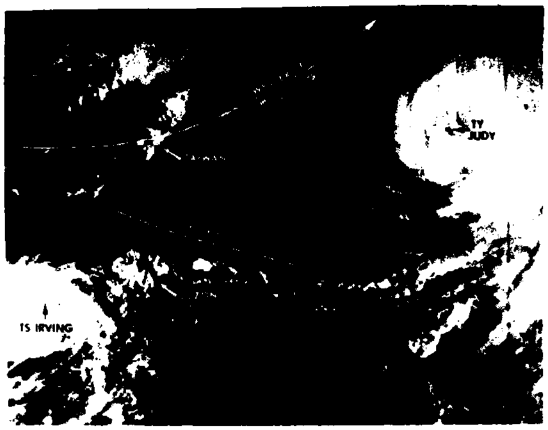


Figure 3-19-5. 100601Z September (NOAA 7 visual imagery)

Figure 3-19-6. 110549Z September (NOAA 7 visual imagery)

On 10 September, Judy was moving slowly (6 to 7 kt (11 to 13 km/hr)) toward the north-northeast; satellite imagery (Figure 3-19-5) shows the cloud signature returning to a more circular appearance. Presumably, the interaction with the TUTT had ceased and the mid- and upper-levels were returning to a more typical environment for a mature typhoon.

Judy accelerated toward Japan on the 11th; this movement had been expected as early as 9 September (near 24N) but was delayed until the influence of low-level steering became favorable for a sustained northward movement. A low-level anti-cyclone, centered near 45N 120E, had been exerting a relatively strong north to northeast flow over the Sea of Japan southward to 27N. On 11 September, this anticyclone began to weaken and its influence on the region north of Judy abated. In response, Judy accelerated from 8 kt (15 km/hr) at 110000Z to well over 25 kt (46 km/hr) before it struck Japan 38 hours later. Figure 3-19-6 shows Judy as this acceleration began.

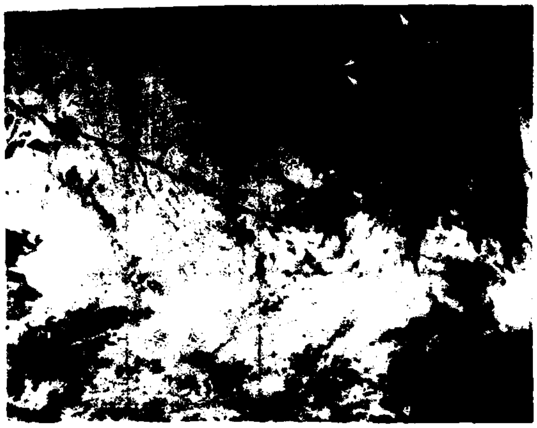
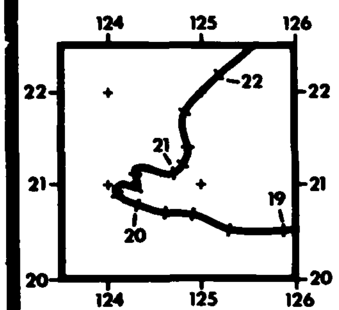


Figure 3-19-7. 111834Z September (NOAA 7 infrared imagery)

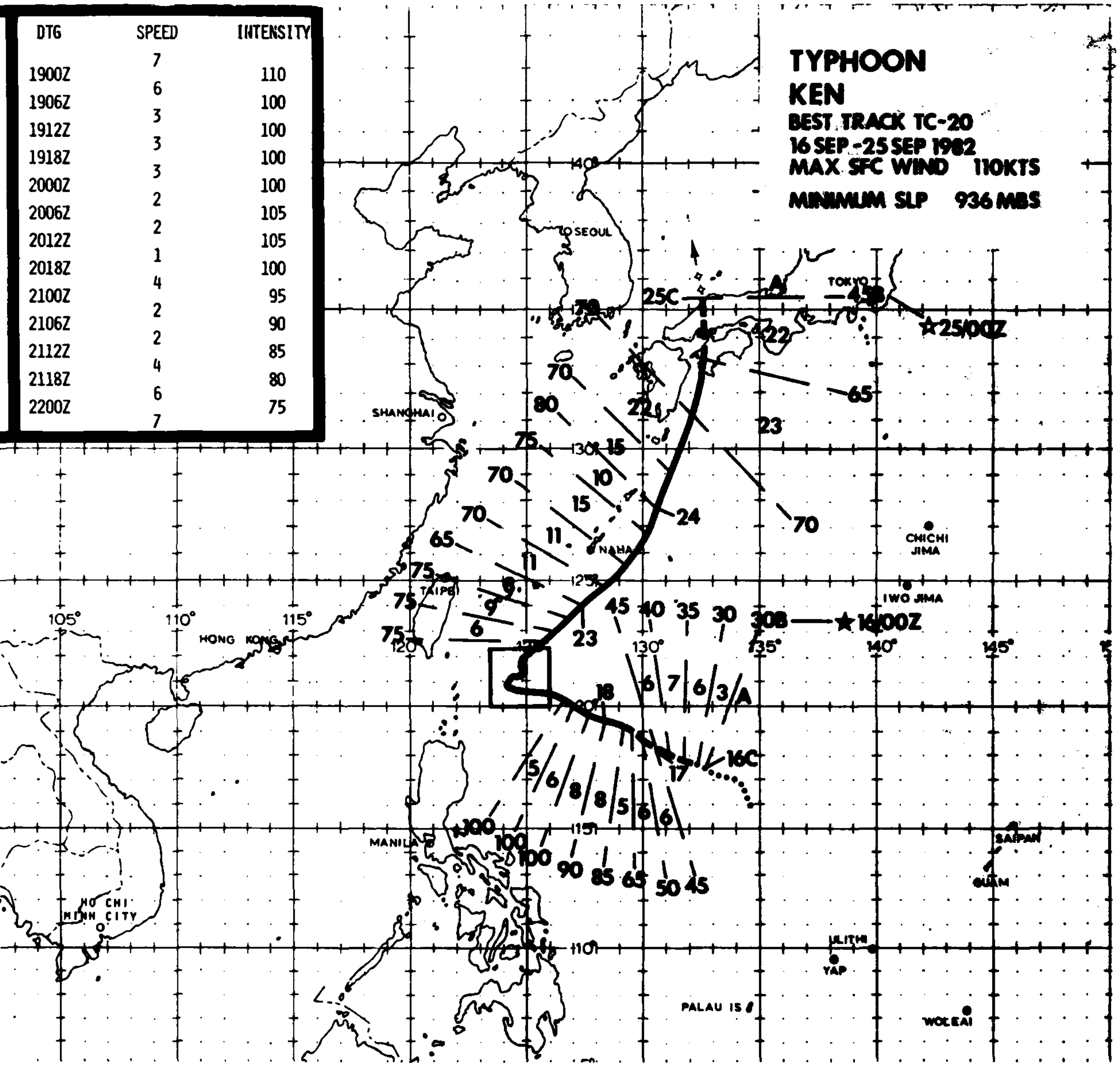
Figure 3-19-8. 121810Z September (NOAA 7 infrared imagery).

As Judy approached 30N, strong upper-level winds from the south-southwest began exerting considerable pressure on Judy. As seen in Figure 3-19-7, convective activity was eroding on the southwestern periphery of Judy's center. This process preceded and accompanied Judy through its extratropical transition (Figure 3-19-8).

At 120800Z, Judy made landfall upon Omaezaki Point in Shizuoka Prefecture, southeast of Nagoya. Judy moved rapidly over the mountainous region of central Honshu and entered the eastern portion of the Sea of Japan where extratropical transition followed. In its wake, Judy left at least 25 dead and the accompanying torrential rains and floods damaged more than 61,000 houses, washed out sections of 956 highways and swept away 46 bridges in an area stretching from Osaka in the south, to Hokkaido in the north.



DTG	SPEED	INTENSITY
	7	
1900Z	6	110
1906Z	3	100
1912Z	3	100
1918Z	3	100
2000Z	2	100
2006Z	2	105
2012Z	1	105
2018Z	4	100
2100Z	2	95
2106Z	2	90
2112Z	4	85
2118Z	6	80
2200Z	7	75



TYPHOON KEN (20)

Typhoon Ken formed in mid-September in the western portion of an elongated monsoon trough in the Philippine Sea. Satellite imagery on 14 and 15 September showed a persistent convective disturbance near 17N 134E with evidence of upper- and lower-level circulation centers. A reconnaissance aircraft mission early on 16 September closed off a surface circulation near 18N 133E, with 10 to 35 kt (5 to 18 m/sec) winds and a minimum sea level pressure of 1003 mb. Based on this information, JTWC elected to forgo the issuance of a Tropical Cyclone Formation Alert and, at 160300Z, the initial warning was issued on Ken as Tropical Depression 20.

Ken was upgraded to tropical storm status on the 161200Z warning after aircraft reconnaissance reported a 999 mb central pressure and sustained winds of 35 kt (18 m/sec). Initial warnings for Ken anticipated movement toward the west, passing near the northern tip of Luzon within 72 hours. These forecasts were based on the apparent strength of the mid-level steering flow along the southern periphery of the subtropical ridge which was centered between Taiwan and Okinawa. Thirty-three hours after the initial warning was issued, Ken was upgraded to typhoon status when aircraft reconnaissance data showed a central pressure of 976 mb, equivalent to an intensity of 65 kt (33 m/sec) (Atkinson and Holliday, 1977). Ken underwent a rapid intensification during the following 24 to 36 hours, with its intensity surpassing 100 kt (51 m/sec) on 18 September. Up to this point in its development Ken was characterized as a compact system; for example, aircraft data at 180600Z indicated a 938 mb central pressure in a 10 nm (19 km) diameter eye with a maximum surface wind of 100 kt (51 m/sec) located within a band of maximum winds only 15 nm (28 km) from the center.

Ken moved much slower than anticipated, and toward the west-northwest, for the first four days in warning status. During this period, a gradual but significant change in the subtropical ridge was taking place; by 19 September the ridge had retrograded southwestward and strengthened over southern China and the northern portion of the South China Sea. JTWC forecasts during this period expected this slow movement to be short-lived based on a forecast strengthening of the ridge north of Ken and a corresponding weakening of the ridge over the South China Sea which would allow Ken to resume its movement westward. This forecast scenario never materialized and, aided by analysis and prognostic fields from the 191200Z data base which provided indications that westward movement was not likely to occur, JTWC forecast tracks turned toward the north commencing with the 200000Z warning. Some of the indicators which prompted JTWC to change the forecast track were: the numerical forecast fields were starting to show a persistent break in the ridge north of Ken vice a strengthening of the ridge; the dynamic tropical cyclone models (OTCM, NTCM) began to consistently forecast a northward movement; and analysis data began to show significant height falls at the 700 mb level were starting to occur north of the ridge over southern Japan.

Despite all the signs predicting a northward movement, Ken eventually became quasi-stationary on 20 September (Figure 3-20-1 shows Ken at its westernmost position) and the character of the associated circulation pattern began to change dramatically; aircraft reconnaissance missions found the center expanding, with the strongest wind bands moving away from the center. The diameter and character of the eye (when observed) was also changing from mission to mission. A possible explanation of what

Figure 3-20-1. Typhoon Ken, at its westernmost position and just beginning a period of very little movement. Note the strong banding toward Ken's center. Within the next two days, much of this center would erode, leaving a nearly cloud-free area 60 nm (111 km) in diameter. 200542Z September (NOAA 7 visual imagery provided by Det 4, 1WW Clark AB RP).

caused Ken to undergo such drastic changes could be the interaction with mid-latitude westerlies advecting much cooler air into Ken's center, thus accounting for formation of the large cloud-free center. The 201200Z 500 mb analysis (Figure 3-20-2) shows the winds from the west moving into Ken's circulation about the time that these changes began. However, this does not explain why Ken's eye dissipated and then reformed within the otherwise cloud-free center, unless the westerlies were diverted from the center for short periods of time, allowing warm, moist air to reenter the center and assist in the reformation of the eye.

Ken's eye was last observed at 212011Z during a double-fix aircraft mission. On the first penetration, the mission Aerial Reconnaissance Weather Officer (ARWO) indicated the eye was 7 nm (13 km) in diameter but on the second penetration, at 212327Z, the ARWO reported "... the eye was so large we couldn't even pick it up on our radar ..."[1]. Further, the band of maximum winds were observed some 60 to 95 nm (111 to 176 km) from Ken's center.

On 21 September, satellite imagery and upper air analysis data indicated the trough north of the subtropical ridge had begun to

[1] Candis L. Weatherford, Capt, USAF, mission ARWO.

deepen. In response, Ken began to move erratically toward the northeast and by 211800Z was on a steady course toward Okinawa. The possibility of significant acceleration was examined as continued interaction with the mid-latitude westerlies seemed likely. A recently developed JTWC forecast aid, TAPT (Weir, 1982), indicated Ken might undergo acceleration near 25N. Indeed, as Ken approached 26N, its forward speed began to increase and acceleration continued until landfall on the island of Shikoku, Japan. During this acceleration period Ken passed 78 nm (143 km) southeast of Okinawa; maximum winds recorded at Kadena AB were 35 kt (18 m/sec) at 230955Z and a peak gust of 58 kt (30 m/sec) at 231135Z. Ken also brought a significant, and much needed, rainfall to Okinawa; 11.09 inches (28.2 cm) were recorded at Kadena on 23 September.

Once past Okinawa, Ken began to gradually weaken under strong mid- and upper-level westerlies. Aircraft reconnaissance missions continued to find the belt of maximum surface winds moving farther away from the center with every fix. Satellite imagery showed a steady decline in convection as Ken continued to move toward Japan. Ken made landfall upon Shikoku at 241700Z, crossed the inland sea, and then moved through western Honshu into the Sea of Japan where it became extratropical at 250000Z.

Ken was the fourth typhoon of the season to hit the main islands of Japan; it brought torrential rains and high winds, which triggered mudslides that flooded or wrecked thousands of homes and paralyzed both air and ground transportation. Reports from the region indicated that a peak gust of 114 kt (59 m/sec) was recorded on Shikoku during Ken's passage along with 8.7 inches (22.1 cm) of rain over one six-hour period.

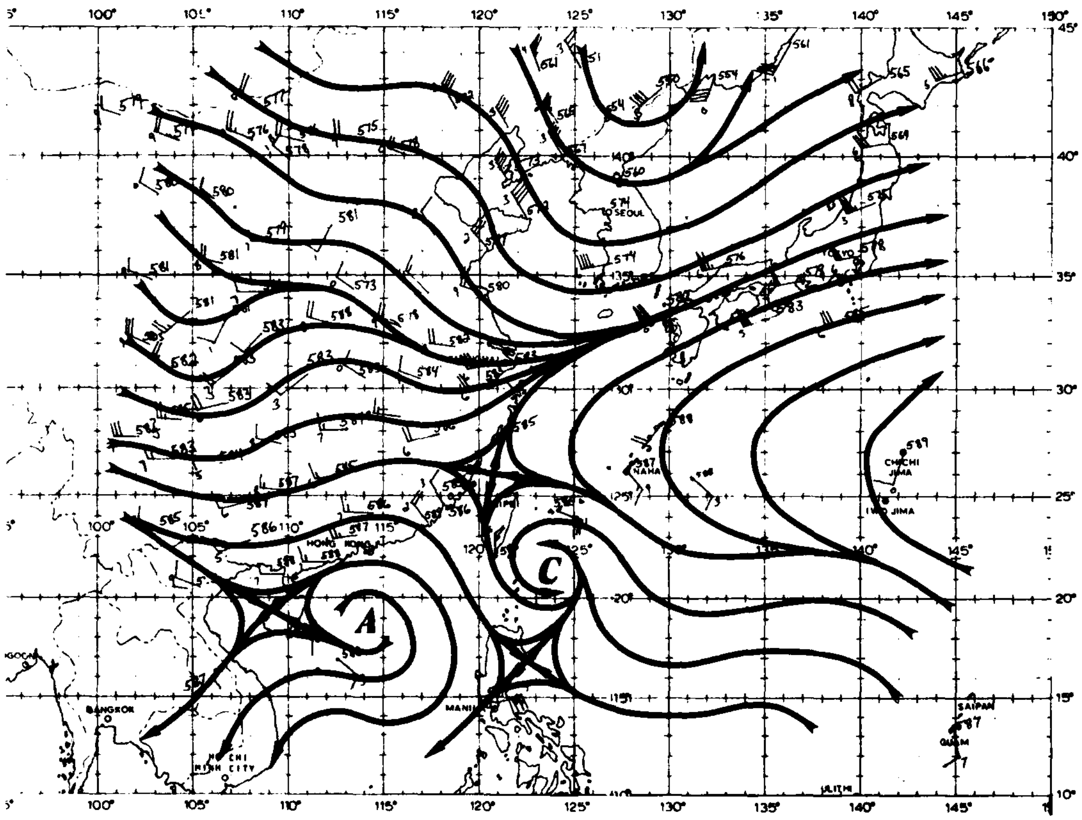
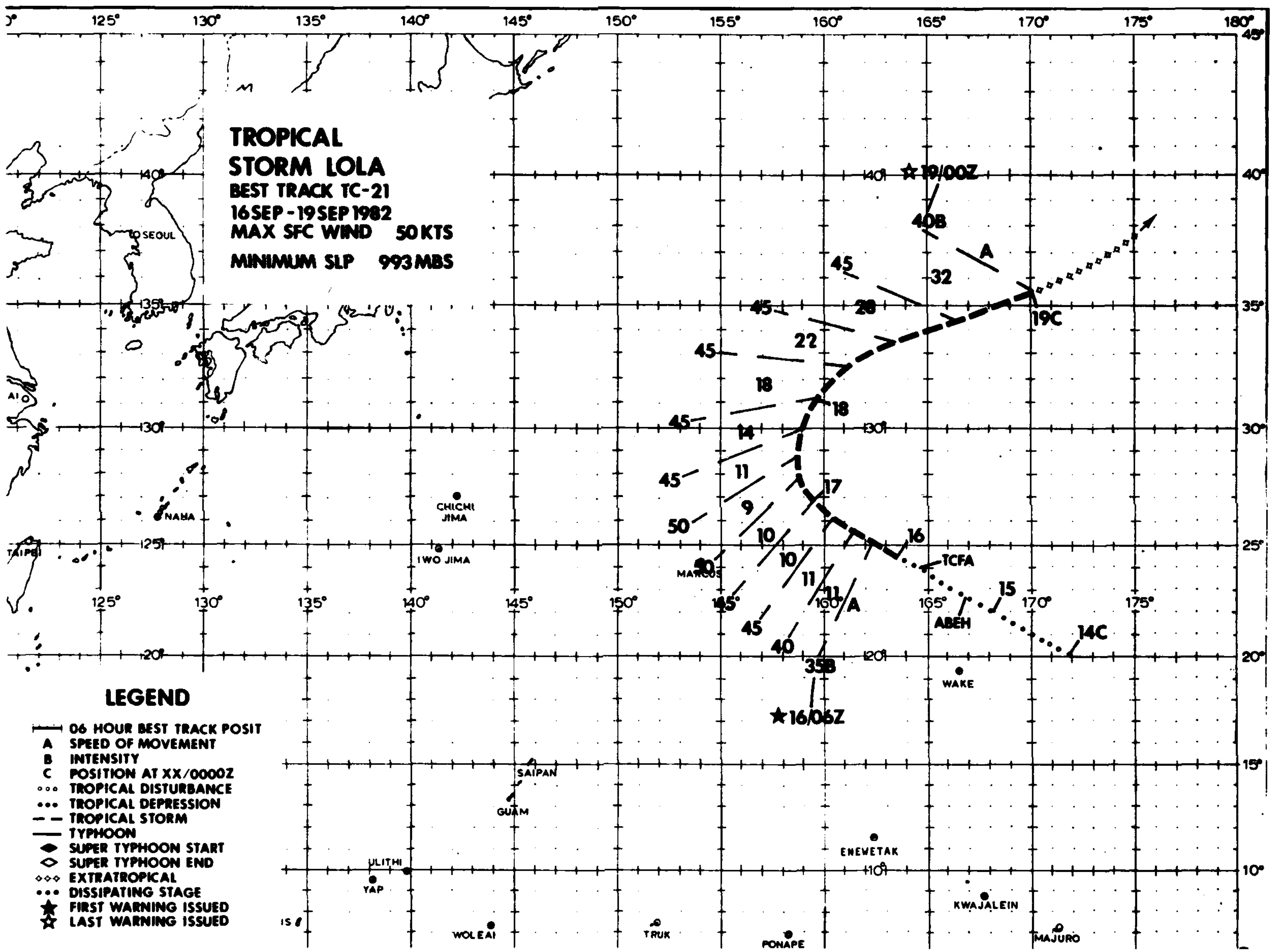


Figure 3-20-2. 500 mb analysis, valid at 201200Z. The strength of the subtropical ridge over China had diminished during the previous 12-hour period. This process allowed mid-latitude westerlies to move further southward and become involved with Ken's circulation pattern. The break in the east-west extension of the ridge, north of Ken, can also be seen. Wind speeds are in knots.


TROPICAL
STORM LOLA
BEST TRACK TC-21
16 SEP - 19 SEP 1982
MAX SFC WIND 50 KTS
MINIMUM SLP 993 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
★16/06Z
☆19/00Z
TCFA
19C
14C
40B
35B
ABEH
SEOUL
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO

TROPICAL STORM LOLA (21)

Tropical Storm Lola was the third tropical cyclone of the season to form in the subtropical latitudes of the western North Pacific Ocean. Typical of tropical cyclones that form north of 20N in the mid- and late summer, Lola's formation was aided by its proximity to a tropical upper tropospheric trough (TUTT) cell (Sadler, 1976) and remained a small, compact tropical cyclone during its lifetime. Due to Lola's remote location, no successful reconnaissance aircraft missions were flown and all fix positions and intensity estimates were based on analyses from satellite imagery.

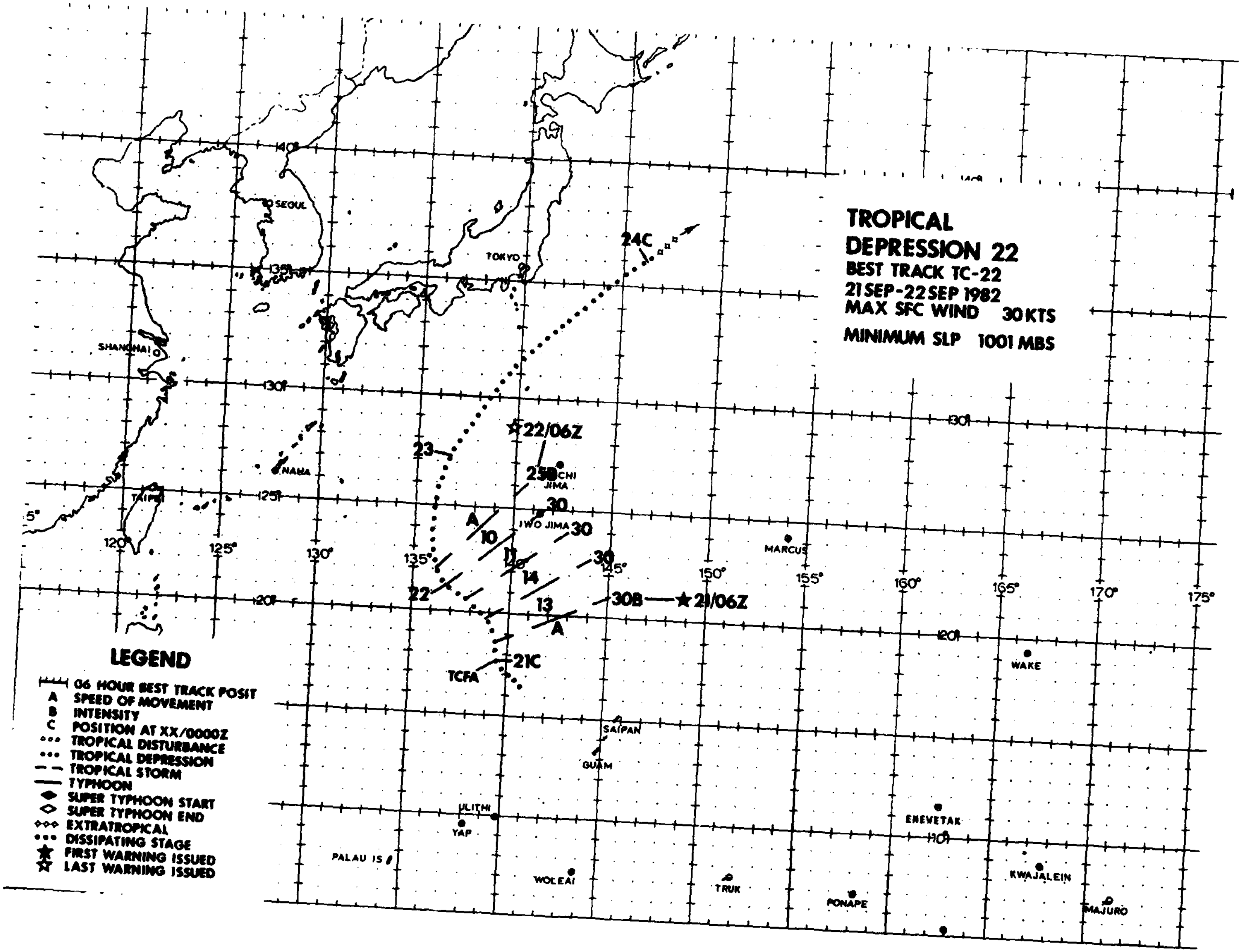
Lola was first detected on satellite imagery as a weakly organized band of convection near the dateline on 13 September. By 140000Z, this convection had moved westward to within 600 nm (1111 km) of a well-defined TUTT cell that was located in the vicinity of Wake Island (WMO 91245). During the ensuing 24 hours, the upper-tropospheric divergence fields appeared to increase in the area and a small anticyclone was soon detected on satellite imagery over the disturbance. During the same period, a low-level shear line from a cold front moved to within 200 nm (370 km), north of the convective disturbance. This shear line appeared to aid the development of the low-level circulation center, as cumulus lines could be detected spiraling into the system's center from the north as early as 150000Z.

Convection remained weak and variable over the next 18 hours; however, at 151829Z a Tropical Cyclone Formation Alert was issued when upper-level outflow increased around the system. During the next 12 hours, convective organization increased and at 160600Z, the first warning was issued for Tropical Storm Lola when the intensity estimate from analysis of visual satellite imagery indicated the likelihood of 35 kt (18 m/sec) surface winds near Lola's center.

Lola's eventual recurvature around a mid-tropospheric anticyclone was well forecast due, in part, to good agreement from the very first forecast with the CYCLOPS steering aids and the One-Way Interactive Tropical Cyclone Model (OTCM).

As Lola approached 30N on 17 September, acceleration toward the northeast began in advance of a newly formed cold front which was moving toward Lola from the northwest. Extratropical transition was completed by 190000Z when Lola became totally entrained into the frontal system.

Figure 3-21-1. Tropical Storm Lola at the point of recurvature as a cold front approaches from the northwest. 170436Z September (NOAA 7 visual imagery).


TROPICAL DEPRESSION 22
BEST TRACK TC-22
21 SEP-22 SEP 1982
MAX SFC WIND 30 KTS
MINIMUM SLP 1001 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
22/06Z
21/06Z
24C
23
22
21C
TCFA
30B
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
WAKE
KWAJALEIN
MAJURO

Tropical Depression 22 began its brief existence as a significant tropical cyclone in the wake of Typhoon Ken (20). An exposed low-level circulation, with convection displaced well west-southwest of the circulation center, was a persistent feature of this system throughout its lifetime as it was apparently dominated by Typhoon Ken's upper-level outflow.

The first aircraft investigative mission flown on 20 September closed a surface circulation with 15 kt (8 m/sec) winds and a central sea level pressure of 1002 mb. The mission Aerial Reconnaissance Weather Officer reported no mid- or upper-level cloud features associated with the low-level center. A second investigative flight on 21 September reported winds had increased to 20 kt (10 m/sec) near the circulation center, while winds of 30 kt (15 m/sec) were evident 70 nm (130 km) south of the center. Convection was displaced 90 nm (167 km) west-southwest of the low-level center but was increasing in intensity. This information prompted the issuance of a Tropical Cyclone Formation Alert (TCFA) at 210123Z.

Subsequent synoptic data carried a growing number of reports of 30 kt (15 m/sec) winds in the alert area, plus visual satellite imagery at 210300Z depicted a strengthening of the low-level circulation. Based on these factors, the first warning was issued on Tropical Depression 22 at 210600Z calling for movement toward the northwest. At this time Typhoon Ken was 900 nm (1667 km) to the west-northwest but minimal interaction was expected. However, Ken's outflow pattern was expected to inhibit rapid development of Tropical Depression 22. Therefore intensification to only 55 kt (28 m/sec) was forecast by the end of 72 hours. (See Figure 3-22-1).

During the ensuing 24-hour period aircraft and satellite data showed no indication of vertical development. Synoptic data at 220000Z indicated that surface winds had weakened to 20 kt (10 m/sec) and surface pressures had not changed from the previous 1002 mb level. Because Tropical Depression 22 was continuing to move more rapidly toward the north-northeast, little opportunity for further development was expected. Additionally, satellite imagery continued to show a weakening of the low-level circulation, thus warnings were suspended at 220700Z.

After dissipating as a significant tropical cyclone, a weak convective disturbance persisted and began accelerating northeastward. This disturbance did maintain enough integrity to induce the development of a small extratropical system upon merging with a frontal zone southeast of Japan on 24 September.

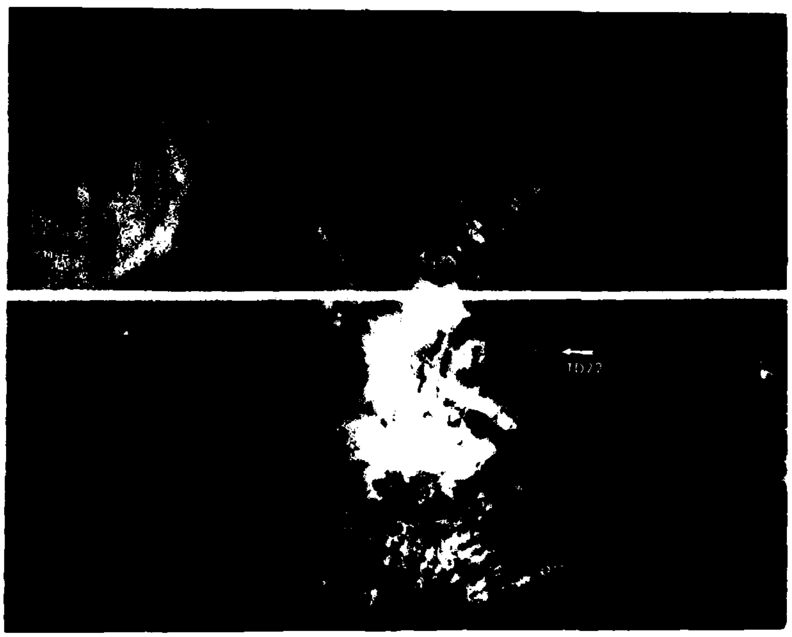
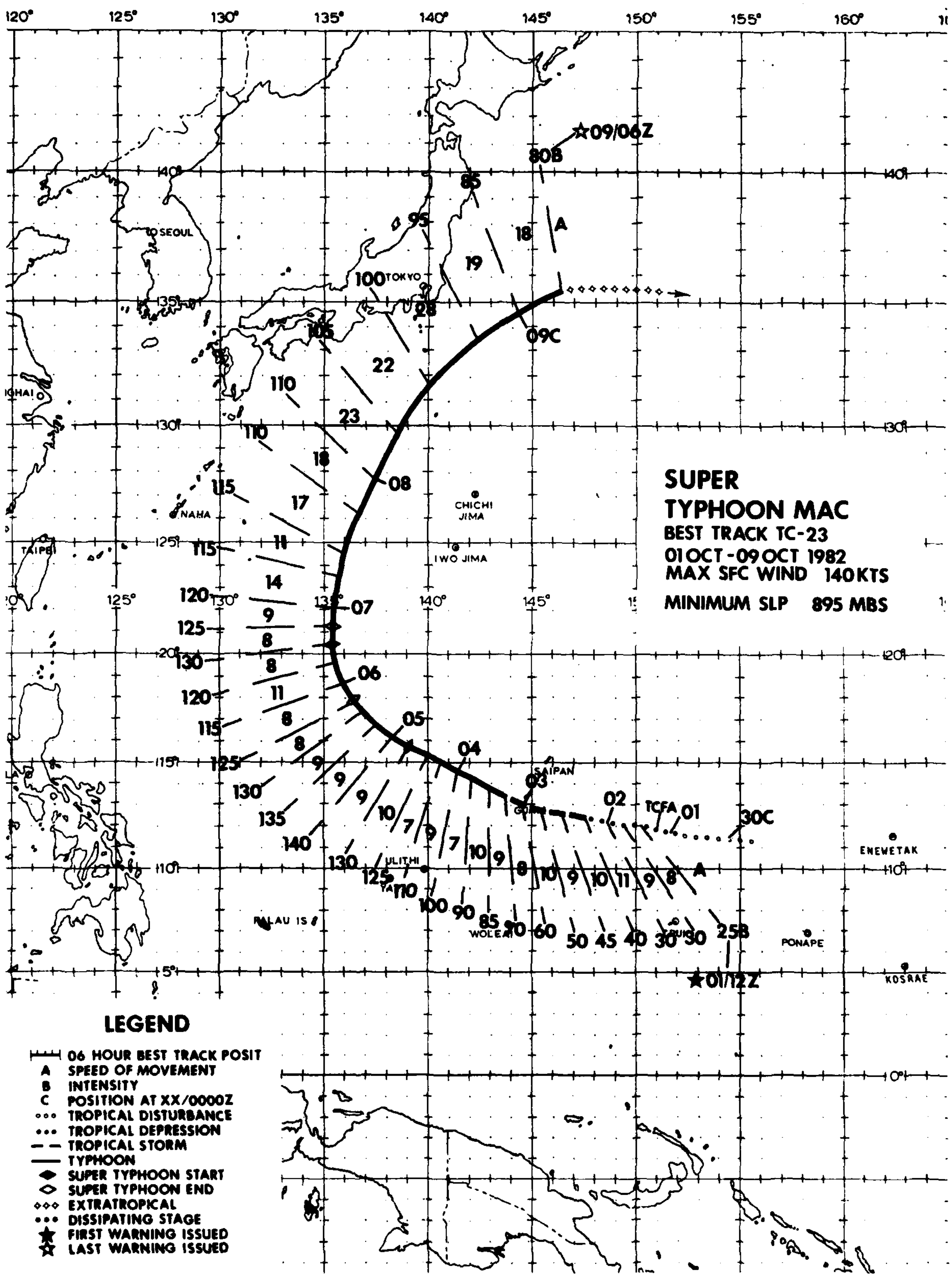


Figure 3-22-1. Tropical Depression 22 at 30 kt (15 m/sec) intensity as an exposed low-level circulation. Convection is displaced to the west-southwest. Typhoon Ken can be seen 900 nm (1667 km) to the northwest. 210529Z September (NOAA 7 visual imagery).



SUPER
TYPHOON MAC
BEST TRACK TC-23
01 OCT - 09 OCT 1982
MAX SFC WIND 140 KTS
MINIMUM SLP 895 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
09/06Z
01/12Z
SEOUL
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
SAIPAN
ULITHI
PALAU IS
WOLEAI
PONAPE
ENEWETAK
KOSRAE
TCFA

Super Typhoon Mac was spawned to the east of Ponape (WMO 91348) in an area which had been under close scrutiny by the Joint Typhoon Warning Center for several days. A persistent surface circulation, with an associated upper-level anticyclone, was closely monitored beginning on 28 September. No signs of significant development were evident until satellite imagery on 1 October revealed that the convective pattern was more conducive to intensification and the upper-level outflow signature was supportive of sustained further growth of the disturbance. Based upon this evidence, a Tropical Cyclone Formation Alert was issued at 010635Z. Further intensification was rapid; the first warning on Tropical Depression 23 was issued at 011200Z after nearby shipboard observations indicated that the surface pressure was as low as 1003 mb and that surface winds had risen to 25 kt (13 m/sec).

Because of Tropical Depression 23's location (near 12N 150E), it became apparent that the system presented a significant threat to the island of Guam. During its formative stages, Mac had moved somewhat erratically but had tracked generally west-northwestward under the influence of steering currents associated with the southern periphery of the subtropical ridge. Initially, numerical forecast fields indicated there would be no change in this steering flow over the next three days and Mac was predicted to continue on a west-northwest course. During this period, rapid intensification was expected due to favorable upper- and lower-level conditions: the relatively small upper-level anticyclone over the system was in close proximity to strong upper-level outflow channels; and at the surface, there was a massive area of inflow from the west with virtually no competition from other circulation centers in the area (Figure 3-23-1).

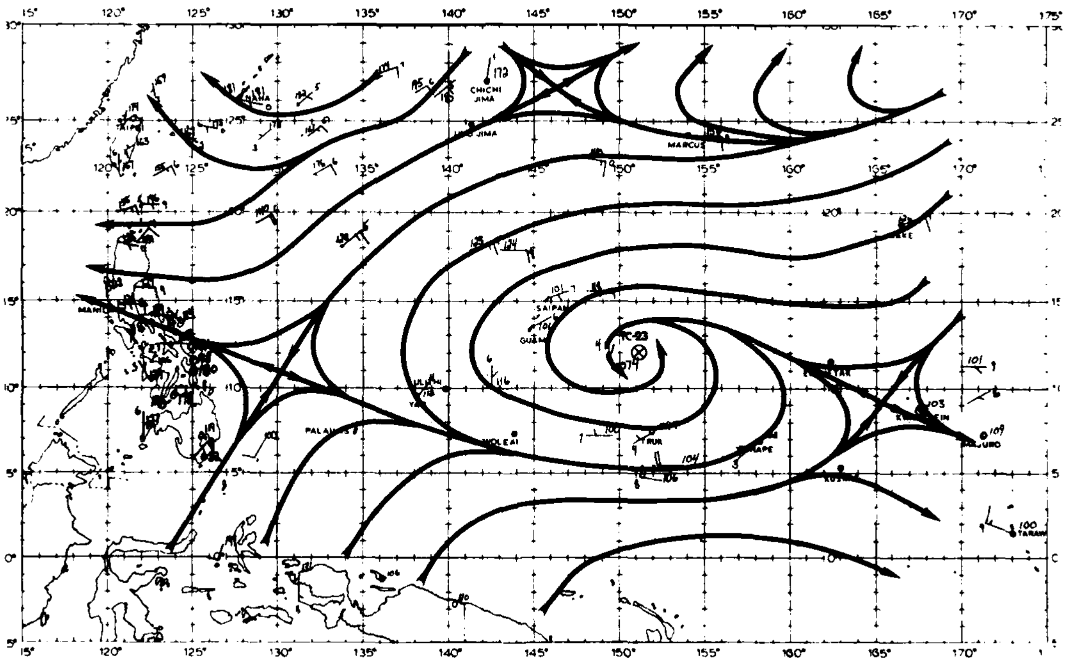


Figure 3-23-1. 011200Z October surface analysis. Wind speeds are in knots.

Figure 3-23-2. Super Typhoon Mac is shown 11 hours after maximum intensity, 050640Z October (NOAA 7 visual imagery).

Initial forecasts proved accurate as Mac passed 10 nm (19 km) southwest of Guam at 030000Z. Although maximum sustained winds within Mac were estimated to be 60 kt (31 m/sec) at closest point of approach to Guam, the highest sustained winds recorded at Nimitz Hill (24 nm (44 km) from Mac's center) were just 30 kt (15 m/sec). Guam experienced little structural or equipment damage because of the fortunate combination of adequate advance warning and preparation, and the compact wind radii associated with Mac. However, crop damage was extensive in the southern part of the island due to the heavy rains and relatively high winds experienced there; the Government of Guam Department of Agriculture estimated damages at 1.5 million dollars.

Mac continued to intensify rapidly after passing Guam. In two days, from the 3rd to the 5th, Mac more than doubled its intensity from 60 kt (31 m/sec) to 140 kt (72 m/sec) (Figure 3-23-2). Figure 3-23-3 shows the trends of various meteorological parameters over Mac's lifetime. The 700 mb data and minimum sea level pressure (MSLP) were derived from reconnaissance aircraft data. Items of particular note include: the dewpoint depression of 28°C, one of the largest ever recorded in a tropical cyclone; the redevelopment to super typhoon strength, only the sixth recorded instance since 1958; the correspondence of the MSLP trends and intensity peaks; and the relatively smooth intensity trend as presented by Dvorak analyses.

During its period of rapid intensification, Mac began to assume a more northwestward track in response to a developing weakness in the subtropical ridge near the Ryukyu Islands. On 5 and 6 October, after having attained super typhoon strength, Mac turned sharply north-northeastward and accelerated. Beginning with forecasts issued on 4 October, which keyed on the break in the subtropical ridge, JTWC anticipated this movement quite well. Because of a deep westerly flow which extended well to the south of the main islands of Japan, Mac never posed a threat to Japan even though it appeared to be right on course toward Tokyo until 8 October.

Once embedded in the mid-latitude westerly flow, Mac accelerated to a maximum forward speed of 28 kt (52 km/hr) but lost little of its intensity. Two days after its recurvature, Mac's intensity had dropped only 30 kt (15 m/sec), i.e. from 125 to 95 kt (64 to 49 m/sec); although Mac remained intense, it rapidly lost its tropical characteristics and transitioned into an extratropical system on 9 October.

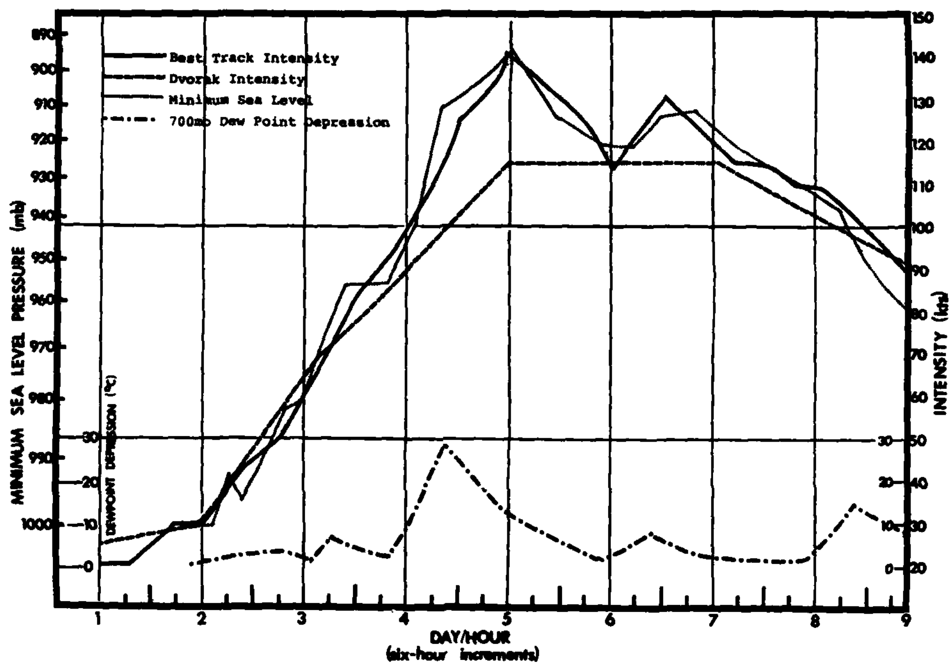
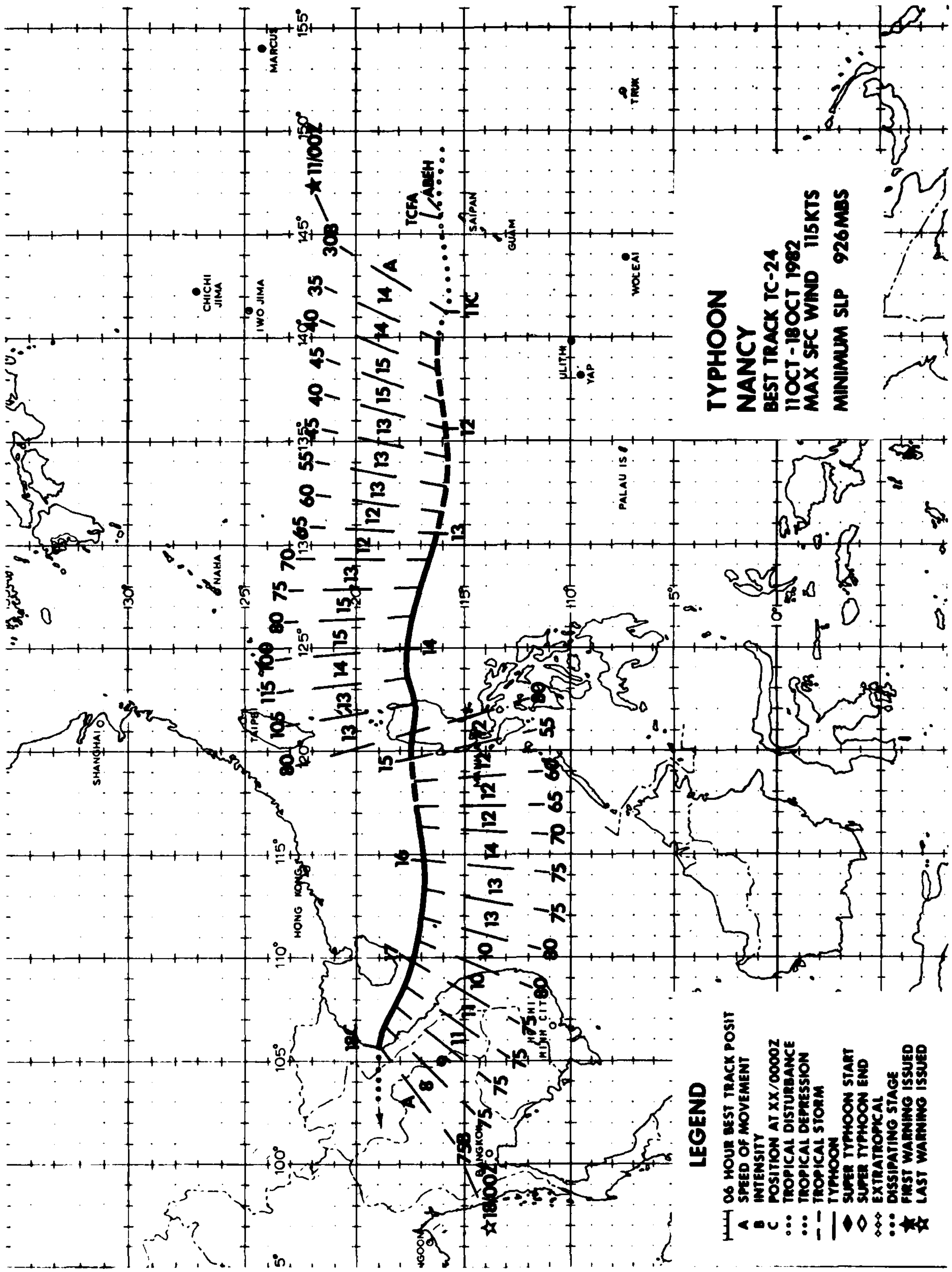


Figure 3-23-3. Comparisons of best track intensities, Dvorak intensity estimates, minimum sea level pressures, and 700 mb dewpoint depressions for the first eight days of Mac's existence.


TYPHOON
NANCY
BEST TRACK TC-24
11OCT - 18OCT 1982
MAX SFC WIND 115KTS
MINIMUM SLP 926MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
11/00Z
18/00Z
TCFA
SHANGHAI
TAIPEI
HONG KONG
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
TRUK
WOLEAI
ULITHI
YAP
PALAU IS
BANGKOK
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°
155°
5°
10°
15°
20°
25°

A large area of weakly organized convection consolidated into a single mass on 8 October near 17N 158E in a region made favorable for cyclogenesis by the divergence aloft near an upper cold low. This convection was strong enough to become separate from the surrounding cloudiness lying south of an upper cold low embedded within a tropical upper-tropospheric trough (TUTT). Sustained surface pressure falls, however, weren't realized as this convective area degenerated later that day into a random pattern of cloudiness. The upper cold low continued to drift westward and was located near 148E on 10 October. This time the conditions were right for cyclogenesis — the upper-level divergence coupled with a pre-existing low-level cyclonic circulation and a tropical depression formed in the enhanced cloudiness just south of the TUTT. This cloudiness was separate and distinct from the routinely observed maximum cloud zone, which lay to the south, between 7N and 10N.

A Tropical Cyclone Formation Alert was issued at 100730Z for the area 200 nm (370 km) north of Guam due to the 1005 mb surface pressures and the significant

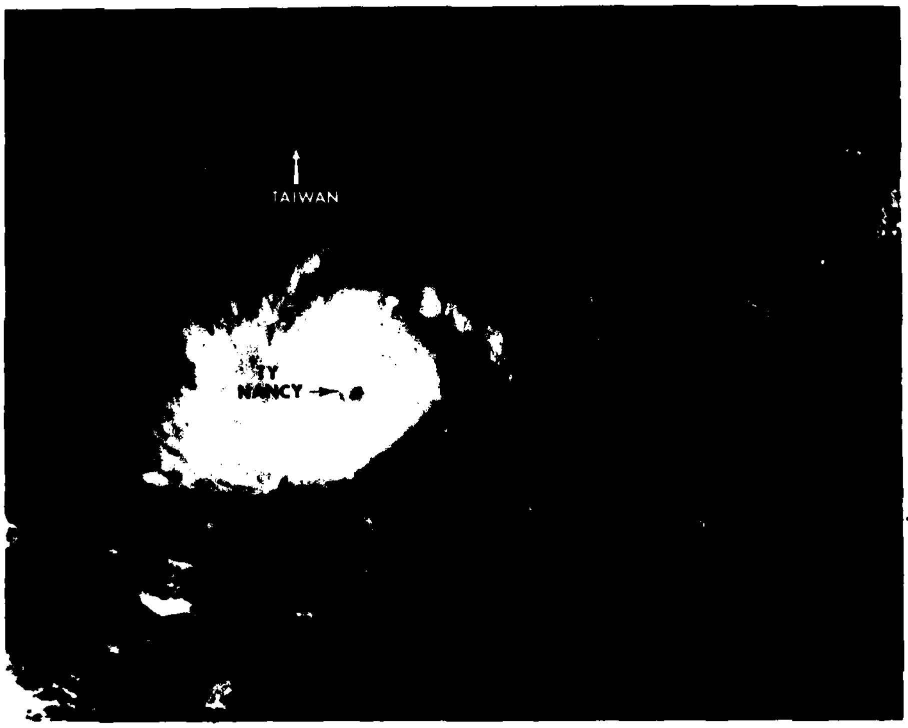


Figure 3-24-1. 140556Z October NOAA 7 visual imagery shows Typhoon Nancy at its peak intensity of 115 kt (59 m/sec) and approximately six hours away from landfall on northern Luzon. Note the island of Taiwan can be seen to the north of Nancy's cloud shields.

increase of cloud pattern organization. Again, because of the sparse conventional data, satellite images had been the key indicator of cyclogenesis and aircraft reconnaissance could not be scheduled to investigate the area until the following day.

The initial reconnaissance aircraft located a closed circulation and surface winds of 25 kt (13 m/sec) which prompted the first warning at 110200Z. Upgrading from tropical depression to tropical storm status followed within six hours, when the follow-on aircraft fix found 35 kt (18 m/sec) winds and a minimum sea level pressure of 999 mb. Nancy stabilized at moderate tropical storm strength and maintained a westward track for the next 24 hours.

Much of Nancy's early warning period was marked by several changes in the basic forecast track. The first four warnings anticipated that Nancy would track northward toward recurvature; however, due in part to the strengthening of the low-level easterly winds north of Nancy, this forecast movement did not occur and Nancy moved rapidly westward with the low-level steering flow. The next four warnings anticipated a west-northwestward movement and through the Bashi Channel, north of Luzon. This track was abandoned at 130000Z when analysis and numerical prognostic data showed evidence that a mid-latitude trough would deepen south of Korea and lessen the influence of the low-level steering on Nancy. Thus until 140600Z (warning 14), the JTWC forecasts showed a pronounced northwestward track toward Taiwan and mainland China. On 14 October, as it became evident that the forecast weakening of the low-level steering current would not materialize, the JTWC forecasts turned toward the west-southwest.

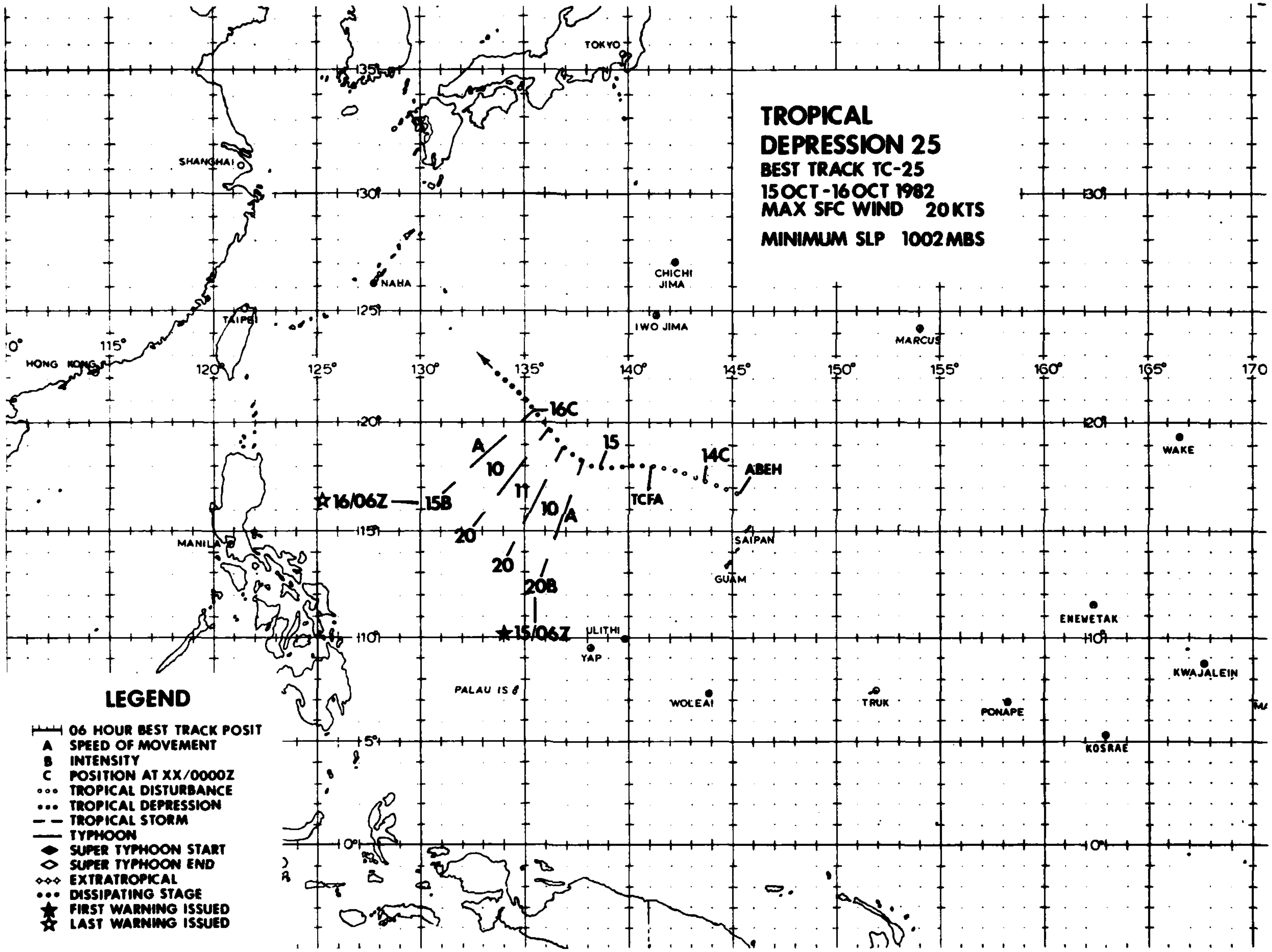
During this period of changing forecast scenarios, Nancy began to intensify. On 13

Figure 3-24-2. Typhoon Nancy was located near 17.0N 113.8E or 210 nm (389 km) east-southeast of the island of Hai-Nan at 160714Z October. Hai-Nan island was located on the northwestern edge of Nancy's cirrus cloud cover. Note the fair weather as indicated by the small, fair weather cumulus over the island and coastal areas of Vietnam, in sharp contrast to the approaching typhoon. (NOAA 7 visual imagery).

October, Nancy attained typhoon strength and then rapidly deepened to a peak intensity of 115 kt (59 m/sec) just six hours prior to landfall on northeastern Luzon. Nancy was reduced to tropical storm strength by a rugged overland transit, but was quick to regain typhoon strength upon reaching the open waters of the South China Sea. Nancy was the most intense typhoon to strike the Republic of the Philippines this year; in its wake, Nancy left at least 110 dead, 12,000 people homeless, and caused an estimated 46 million dollars damage.

The presence of a continuing strong mid- and upper-level circulation pattern made Nancy's reintensification in the South China Sea possible. At 161200Z, Nancy reached a second peak intensity of 80 kt (41 m/sec) as it passed just north of the Paracel Islands (WMO 59981). The influence of a subtropical ridge over southern China and the continuing presence of of the low-level northeasterly (monsoon) flow across the South China Sea kept Nancy on a westward track until it approached Hai-Nan Island late on 16 October. From near Hai-Nan until landfall, Nancy maintained a slower, northwestward track along the southern periphery of the subtropical ridge.

On 18 October, Nancy crossed the coast of Vietnam 15 nm (38 km) north of the city of Vinh (18.7N 105.7E) in the Nghe Tinh province, causing at least 71 deaths, leaving 194,200 people homeless, and devasting 185 square miles (48,000 hectares) of winter rice crops that were ready for harvest. Later satellite imagery (at 180600Z) indicated that Nancy's central convection had dissipated over the mountains of Vietnam.



TROPICAL
DEPRESSION 25
BEST TRACK TC-25
15 OCT - 16 OCT 1982
MAX SFC WIND 20 KTS
MINIMUM SLP 1002 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
16C
15
14C
ABEH
TCFA
16/06Z
15B
15/06Z
20B
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
KOSRAE

TROPICAL DEPRESSION 25

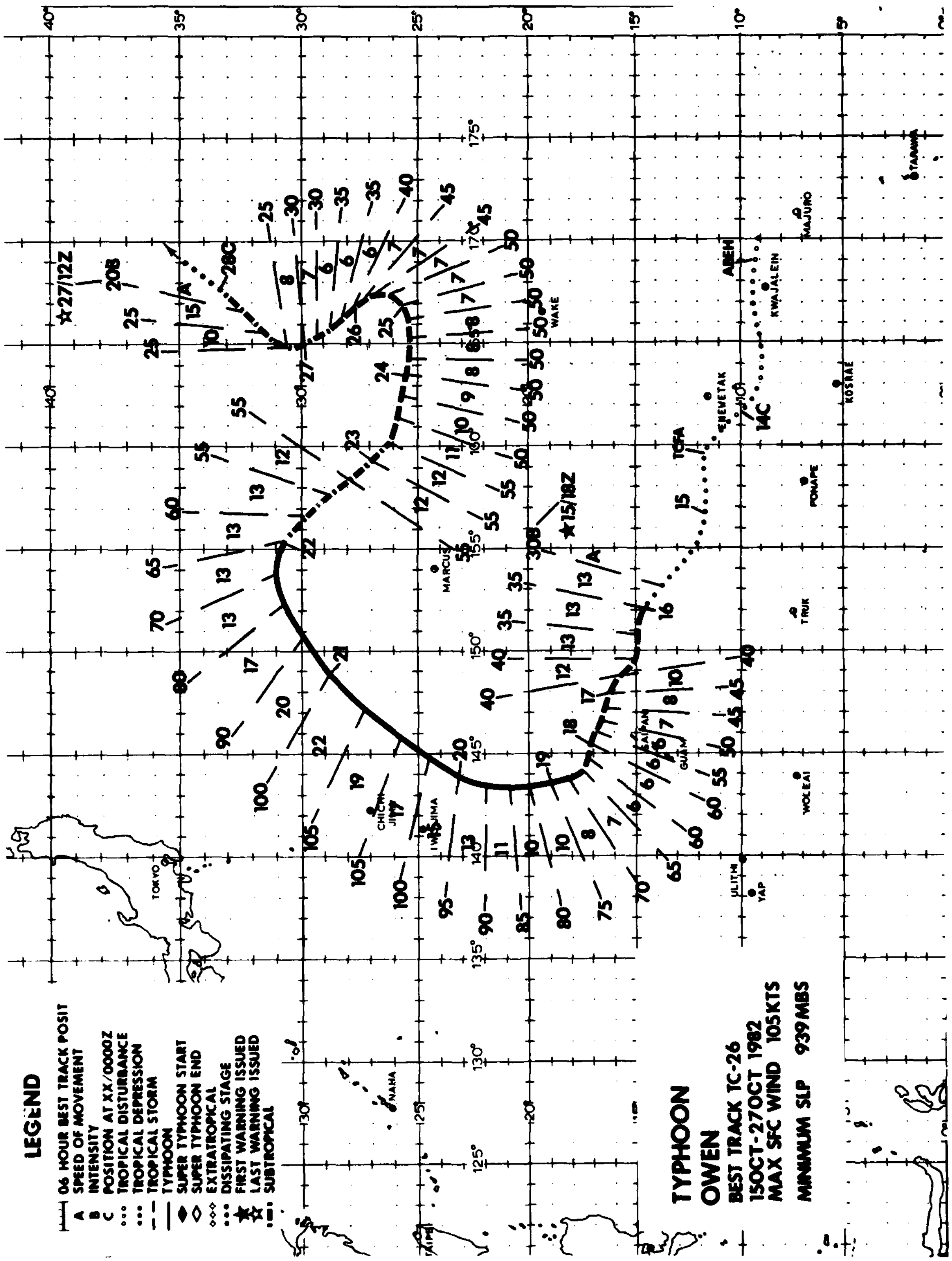
On 14 October, surface observations indicated a weak circulation center near 18N 141E. Satellite analysis of the area revealed the presence of an upper-level anticyclone with potential to enhance the ventilation of the surface system. Expecting further development once the system attained vertical alignment, JTWC issued a Tropical Cyclone Formation Alert (TCFA) at 141200Z.

Aircraft reconnaissance at 142336Z located a weak surface circulation near 18N 139E, with central pressures estimated to be near 1006 mb. The initial warning on Tropical Depression 25 was issued after 150000Z satellite imagery showed the convective area near the center was becoming more organized.

Subsequent aircraft reconnaissance of the system at 150900Z reported maximum winds less than 10 kt (5 m/sec), and the circulation center could not be fixed by either winds or pressures. Satellite imagery indicated that the convection associated with the system had greatly weakened, and the overall organization had decreased. The subsequent warning, at 151200Z, anticipated further weakening of Tropical Depression 25 and the forecast period was shortened to 24 hours. On the following day, visual satellite imagery at 160000Z, with corroborative synoptic data, indicated that Tropical Depression 25 had become a fully exposed low-level circulation with no associated major convection. Thus, the final warning on Tropical Depression 25 was issued at 160600Z.

For the next 48 hours, this exposed low-level circulation remained evident on visual satellite imagery, as it progressed to the northwest. Re-development of some convective banding, curving into the system was observed on 18 October. The development of a weak anticyclonic pattern aloft prompted the issuance of a TCFA for the area, near 21N 134E, at 180800Z. A low-level aircraft investigative mission was conducted at 190200Z, but was unable to locate a closed circulation center.

Early on 19 October, when the remains of Tropical Depression 25 were entrained into the expanding low-level inflow pattern associated with Typhoon Owen (26), the TCFA was cancelled.


LEGEND
06 HOUR BEST TRACK POSIT
SPEED OF MOVEMENT
INTENSITY
POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SUBTROPICAL
TYPHOON
OWEN
BEST TRACK TC-26
15OCT-27OCT 1982
MAX SFC WIND 105KTS
MINIMUM SLP 939MBS
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
WOLEAI
YAP
ULITHI
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
MAJURO
TARAWA
★15/18Z
☆27/12Z

Typhoon Owen culminated an active 14-week period (22 July through 27 October) during which 17 tropical cyclones reached warning status in the western North Pacific. During this period, only 10 calendar days did not have at least one tropical cyclone in warning status, with five days (26 to 30 September) the longest period without warnings. So obvious was the cessation of this period that four weeks elapsed between the final warning on Owen and the initial warning on the next tropical cyclone, Pamela (27).

Owen developed from a disturbance which was first detected on 13 October east of Kwajalein Atoll. On 14 October increased convective organization became evident on satellite imagery and, at 141200Z, a Tropical Cyclone Formation Alert was issued. During the subsequent 36-hour period, the disturbance slowly organized, e.g. a reconnaissance aircraft investigative mission conducted on 14 October located a weak surface circulation approximately 100 nm (185 km) east of the convective center. However, by 151800Z the convective features were indicative of a system of sufficient intensity to warrant transition to warning status, thus the initial warning was issued for Tropical Depression 26.

During the first 24 hours in warning status, positioning from aircraft and satellite data became more consistent, e.g. the 152317Z aircraft fix was located approximately 90 nm (167 km) east of the 160000Z satellite fix; by 162100Z the difference was less than 20 nm (37 km). As Figure 3-26-1 depicts, a strong upper-level tilt to the south was evident, but low-level cumulus cloud lines, detected north of the main convective mass, provided evidence of Owen's continued organization. Owen is another example of non-vertical alignment of developing tropical cyclones (Huntley and Diercks, 1981). Such systems normally become better aligned as they mature and Owen was no exception; on 18 and 19 October, the tilt became less evident and Owen responded by attaining typhoon strength at 181200Z and developing a banding-type eye on 19 October.

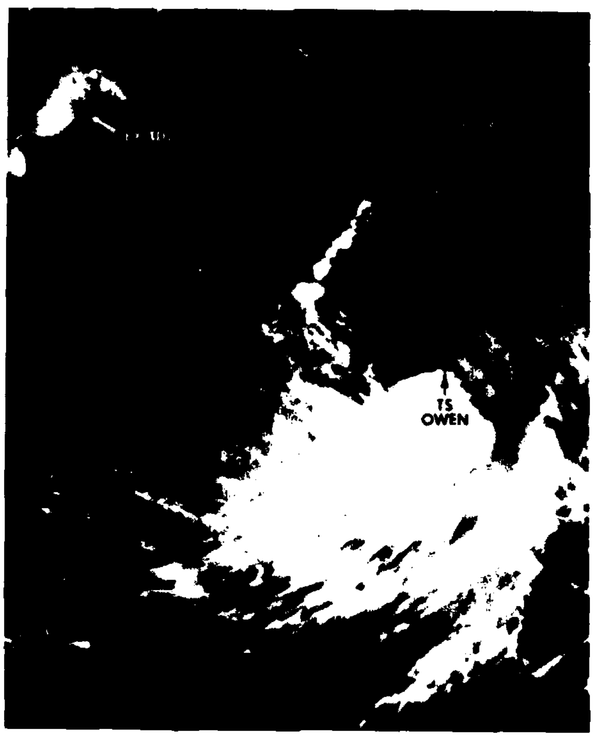


Figure 3-26-1. Low-level cumulus cloud lines can be seen entering Owen's center while the main convective features are displaced equatorward of the low-level center. Strong upper-level northeasterly winds are providing a unidirectional outflow channel toward the southwest. 170520Z October (NOAA 7 visual imagery).

While Owen was aligning in the vertical, it also began to slow its forward movement appreciably, from 13 to 6 kt (24 to 11 km/hr). Track forecasts (describing a west-northwest movement) were adequate until the system reached 17.5N 144E at 181200Z, when Owen turned sharply northward. Although most forecasts up to this point had anticipated an eventual northward movement, none fully anticipated the extent of Owen's turn on 18 October. This movement can be related to the development of a blocking high east of Japan. (Actually, the FNOC prognostic series more than adequately forecast this development, but an extension of the mid-tropospheric (500 mb) subtropical ridge north of Owen and westward to 135E was seen by forecasters as an inhibiting factor to more significant northward movement). The development of the block increased the south-to-north flow in the mid-levels, leading to an erosion of the subtropical ridge north of Owen and thus, allowed the typhoon to move northward.

From 19 to 21 October, Owen accelerated northward toward an anticipated extratropical transition, reaching a peak intensity of 105 kt (54 m/sec) (Figure 3-26-2). Speed of movement forecasts during this period were quite good and fully anticipated Owen's acceleration from 10 to 22 kt (19 to 41 km/hr). However, the track forecasts did not fair as well, primarily due to the conflicting options presented by the flow around the block. Figure 3-26-3 shows the configuration of the mid-tropospheric (500 mb) flow near the block on 20 October, as well as the various forecast tracks issued (from 190000Z to 210000Z) and Owen's eventual best track. As can be seen, forecasts 14 through 17 tended toward the east (south of the blocking high), forecasts 18 and 19 anticipated that Owen would move northward toward an occluded low near Kamchatka, and forecasts 20 through 22 seemed to split the difference. On 21 October, Owen's antici-pated extratropical transition was well underway; its associated convective features

Figure 3-26-2. Typhoon Owen near maximum intensity, 710 nm (1315 km) south-southeast of Tokyo, Japan at 200443Z October (NOAA 7 visual imagery)

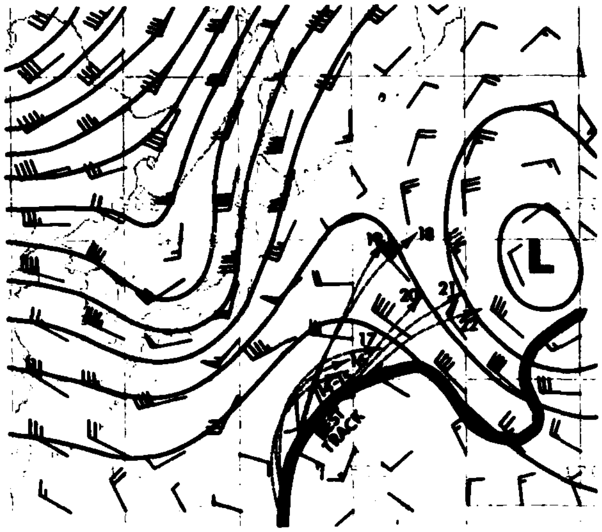


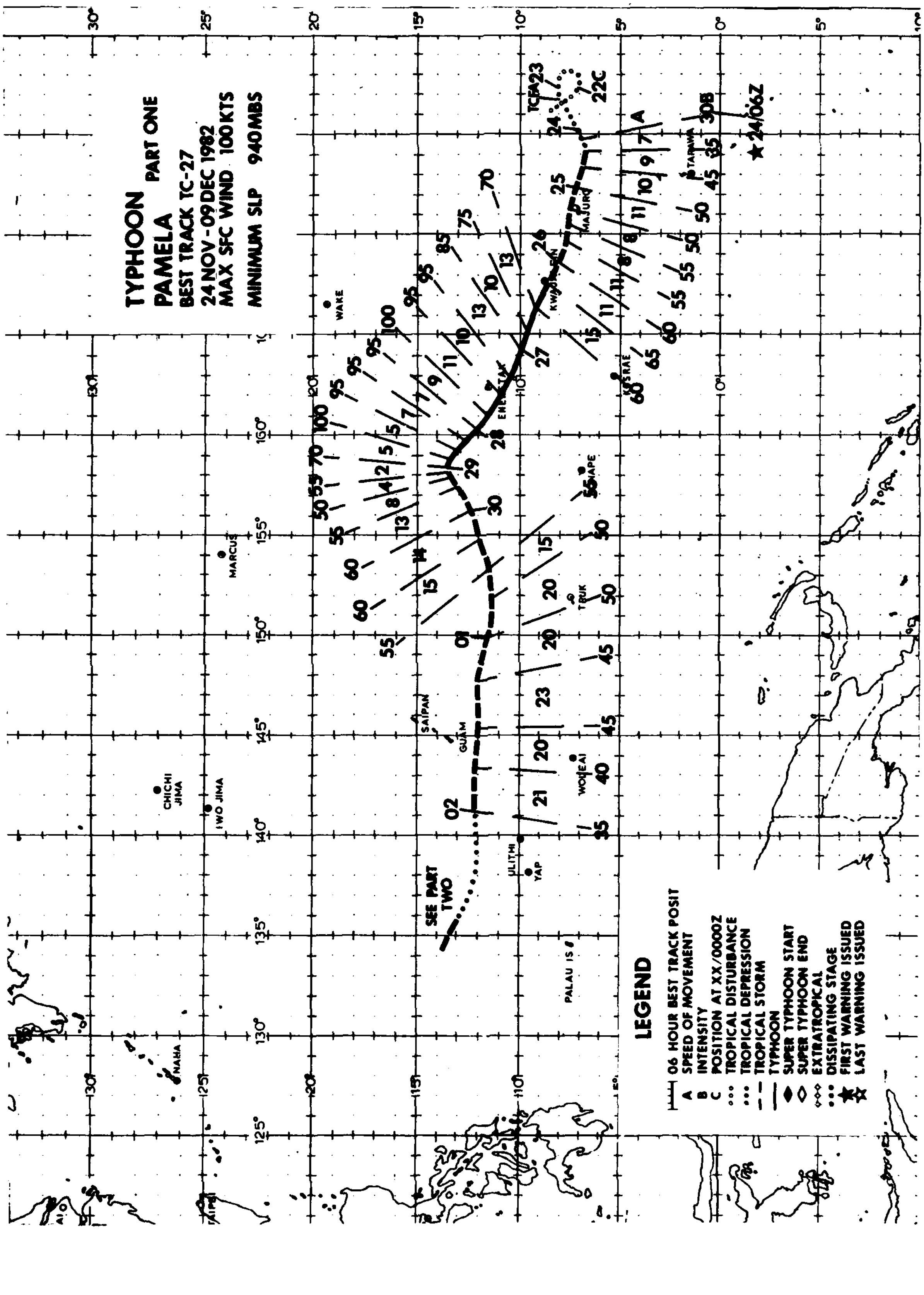
Figure 3-26-3. FNOC 500 mb analysis at 200000Z October with warnings 14 through 22 and Owen's best track superimposed. Wind speeds in knots.

were being sheared northward (away from the surface center), low-level inflow from the mid-latitudes dominated Owen's surface circulation pattern, and aircraft reports showed the band of maximum winds moving further from the center (135 nm (232 km) at 210704Z).

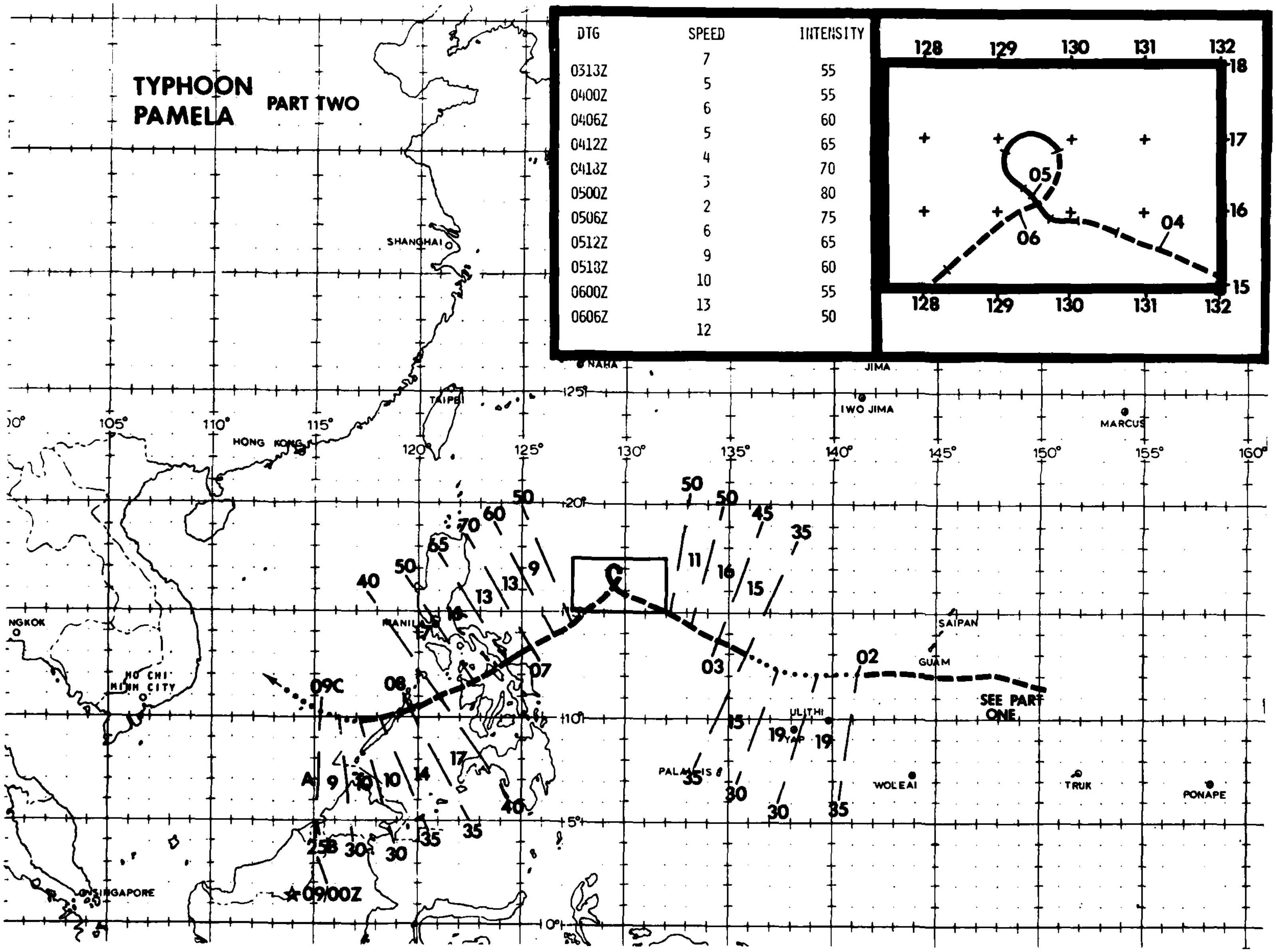
Numbered tropical cyclone warnings ended at 220000Z when satellite imagery indicated that Owen had transitioned to an extra-tropical low. During the next two days, extratropical gale warnings were issued by the NOCC Operations Department as the system tracked southeastward and south of the blocking high. On 23 October an increase in convective activity was noted equatorward of the system center (Figure 3-26-4) and during the next 24 hours it was closely monitored for possible reclassification as "tropical" vice "extratropical" or "sub-tropical" cyclone. The decision to redesignate Owen as a tropical cyclone occurred on 24 October when the convection began to reorganize around the system's center.

For the next 24 hours, Owen tracked eastward and maintained an estimated 50 kt (26 m/sec) intensity. Satellite fixes on 25 October began to indicate a pronounced northward track and a steady decrease in convective activity. From 25 to 27 October, the block, which had dominated the region for more than one week, began to break down and move eastward toward the International Dateline. As Owen moved north-northwestward then northeastward, it slowly weakened and dissipated in the warm sector of an advancing frontal system. The final tropical cyclone warning was issued for Owen (as Tropical Depression 26) at 271200Z some 1400 nm (2593 km) north of its point of initial detection after completing a track in excess of 3600 nm (6668 km).

Figure 3-26-4. At 240355Z October, a significant increase in convection is evident near the system's center; at the time Owen was in warning status as an extratropical low (NOAA 7 visual imagery).



TYPHOON
PAMELA
PART ONE
BEST TRACK TC-27
24 NOV - 09 DEC 1982
MAX SFC WIND 100 KTS
MINIMUM SLP 940 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEE PART TWO
TCFA 23
24/06Z
WAKE
MARCUS
SAIPAN
GUAM
CHICHI JIMA
IWO JIMA
ULITHI
YAP
WOLEAI
TRUK
PONAPE
KOSRAE
KWAJALEIN
MAJURO
TARAWA
ENIWETAK
PALAU IS
NAHA



DTG	SPEED	INTENSITY
0313Z	7	55
0400Z	5	55
0406Z	6	60
0412Z	5	65
0418Z	4	70
0500Z	3	80
0506Z	2	75
0512Z	6	65
0518Z	9	60
0600Z	10	55
0606Z	13	50
	12	

Typhoon Pamela, the 27th significant tropical cyclone of the season, formed east of the Marshall Islands on 24 November. Uncommon for a late season tropical cyclone, Pamela went on to become the longest running, in terms of time and distance, tropical cyclone of the year before dissipating in the South China Sea on 9 December. During its active warning period, Pamela was upgraded to typhoon status on four distinct occasions (reduced to three in post-analysis), a very rare phenomenon.

Development was first observed on 21 November with the formation of an upper-level anticyclone which had some convective activity along its northern outflow band. Visual satellite imagery on 22 November showed a low-level circulation was present near 6N 177E. During the next 48 hours, this disturbance lingered in the region east of 175E with convective activity fluctuating near the center; however, a slow increase in organization, conducive to further development, was observed.

The slow development of this disturbance is attributed to the proximity of Hurricane Iwa (04C) in the eastern North Pacific. As Iwa moved northeastward and passed the Hawaiian Islands, the disturbance (Pamela) began moving westward. A noticeable increase in convection was observed, leading to the issuance of a Tropical Cyclone Formation Alert at 230600Z for an area east of Majuro Atoll. The system further organized, thus prompting the initial warning on Tropical Depression 27 at 240600Z. When the system developed a central convective feature, accompanied by a well-defined upper-level outflow pattern, it was upgraded to Tropical Storm Pamela at 241200Z.

The first several warnings called for movement toward the west-northwest with gradual intensification. These warnings were based on a forecast weakening of the subtropical ridge northwest of the system under the influence of a mid-latitude trough moving eastward from Japan. Indeed, Pamela moved west-northwestward through the Marshall Islands in the ensuing 84 hours. Satellite and aircraft reconnaissance data confirmed the gradual intensification of the system, with Pamela attaining typhoon status at 260600Z while passing approximately 60 nm (111 km) south-southeast of Kwajelein Atoll. By the time Pamela passed 35 nm (65 km) southwest of Enewetak Atoll at 271200Z, its intensity was estimated (from aircraft data) to be 95 kt (49 m/sec) (Figure 3-27-1). Initial reports from the Marshall Islands indicated moderate to severe damage to buildings and crops from those islands affected by Pamela's passage, but there were no reports of loss of life.

Figure 3-27-1. Typhoon Pamela, 15 hours prior to reaching maximum intensity of 100 kts (51 m/sec), 270348Z November (NOAA 7 visual imagery).

Once past the Marshall Islands, Pamela's forward speed began to slow as the system started to come under the influence of a mid-latitude trough passing to the north. As Pamela approached 19N it began to rapidly weaken as it encountered a mid- to upper-level shear zone associated with the trough. Evidence of the rapidity with which Pamela weakened is seen in the aircraft reconnaissance data. At 282105Z, a central pressure of 950 mb and an observed 100 kt (51 m/sec) surface wind were reported. A second reconnaissance mission about nine and one-half hours later (at 290640Z) reported a 979 mb central pressure and observed surface winds of only 50 kt (26 m/sec). This second report necessitated the downgrading of Pamela to tropical storm status on the subsequent warning. A much-weakened Pamela then moved toward the southwest and began to accelerate after breaking away from the effects of the trough and shear zone. This movement was in response to a strong northeast monsoonal flow which was present in the wake of the eastward-moving mid-latitude trough.

Commencing with the 291800Z warning, Pamela was forecast to reintensify and move westward along the southern periphery of the subtropical ridge, eventually passing near the island of Guam. The residents of Guam, remembering the devastation caused by Super Typhoon Pamela (May, 1976), had been nervously watching "Pamela's" progress since its designation while still some 1800 nm (3335 km) east of Guam. Needless-to-say, island residents began to prepare for a possible repeat of the conditions associated with Pamela's 1976 namesake.

Pamela continued to accelerate toward the southwest until 301200Z when it began to move westward. During this period, Pamela continued to weaken; instead of gaining the expected mid- and upper-level support for reintensification, Pamela remained disorganized and the anticapted intensification did not materialize. The 011200Z December 500 mb analysis, for example, did not show any mid-tropospheric circulation center near Pamela's low-level vortex.

Although Pamela was still weakening, it was considered a potentially dangerous tropical cyclone. At 011200Z, Pamela was located 90 nm (169 km) southeast of Guam and was moving westward at 23 kt (42 km/hr); its closest point of approach (to Guam) came two hours later with the maximum recorded wind (gust) of 40 kt (21 m/sec), far below the 138 kt (71 m/sec) gust observed during Super Typhoon Pamela in 1976.

At 011532Z, a reconnaissance aircraft was able to locate Pamela's 700 mb center 90 nm (169 km) southwest of Guam. Data from this fix indicated that Pamela's intensity had decreased to 49 kt (21 m/sec). The same aircraft was tasked to provide another fix of the 700 mb center at 011800Z but was unable to close off the circulation (the surface center was not observable due to darkness). The mission Aerial Reconnaissance Weather Officer (ARWO) felt that the 700 mb center had dissipated into a trough, providing further evidence that Pamela was continuing its weakening trend. A "resources permitting" "first-light" aircraft fix was requested for 012200Z. The aircraft orbited south of the main convection until daybreak; then, responding to a satellite position provided to JTWC by Det 1, 1WW, the aircraft was able to locate the surface center at 012150Z with an estimated 35 kt (19 m/sec) intensity.

During the next 24 hours, Pamela continued to move westward and weaken. Satellite imagery (Figure 3-27-2) and aircraft reconnaissance data revealed that Pamela had become a tropical depression by 030600Z. During this period, JTWC was forecasting Pamela to dissipate as a significant tropical cyclone over water within 48 hours.

Pamela, again as Tropical Depression 27, started to slow its forward speed and began to move toward the northwest, responding to another mid-latitude trough moving off the coast of Asia. Once this northwest movement began, indications that Pamela might reintensify became evident. First, the 021200Z 500 mb analysis suggested that a mid-tropospheric circulation had reformed; and second, aircraft reconnaissance at 022126Z was once again able to close off a 700 mb center with data indicating that an intensity of 35 kt (18 m/sec) had been reached. Later reconnaissance aircraft missions showed that Pamela was continuing its reintensification and it passed from tropical storm status to typhoon status (again) at 041200Z. During this period of reintensification, Pamela reached a maximum intensity of 80 kt (41 m/sec) while concurrently slowing to a minimum speed of 2 kt (4 km/hr) at 050000Z (Figure 3-27-3).

JTWC objective forecast aids and FNOC prognostic fields began to indicate the potential for recurvature once Pamela approached the axis of the (mid-tropospheric) subtropical ridge, near 17N. The 040000Z warning was the first to reflect a recurvature scenario. The numerical prognostic

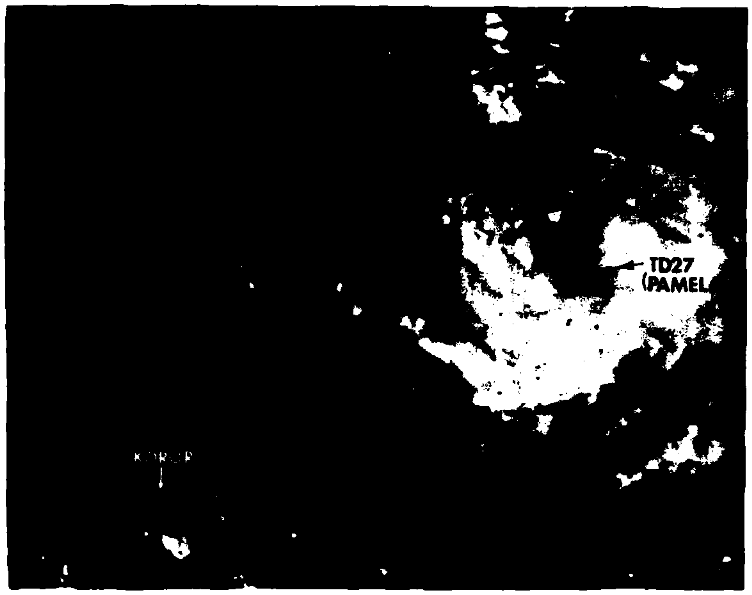
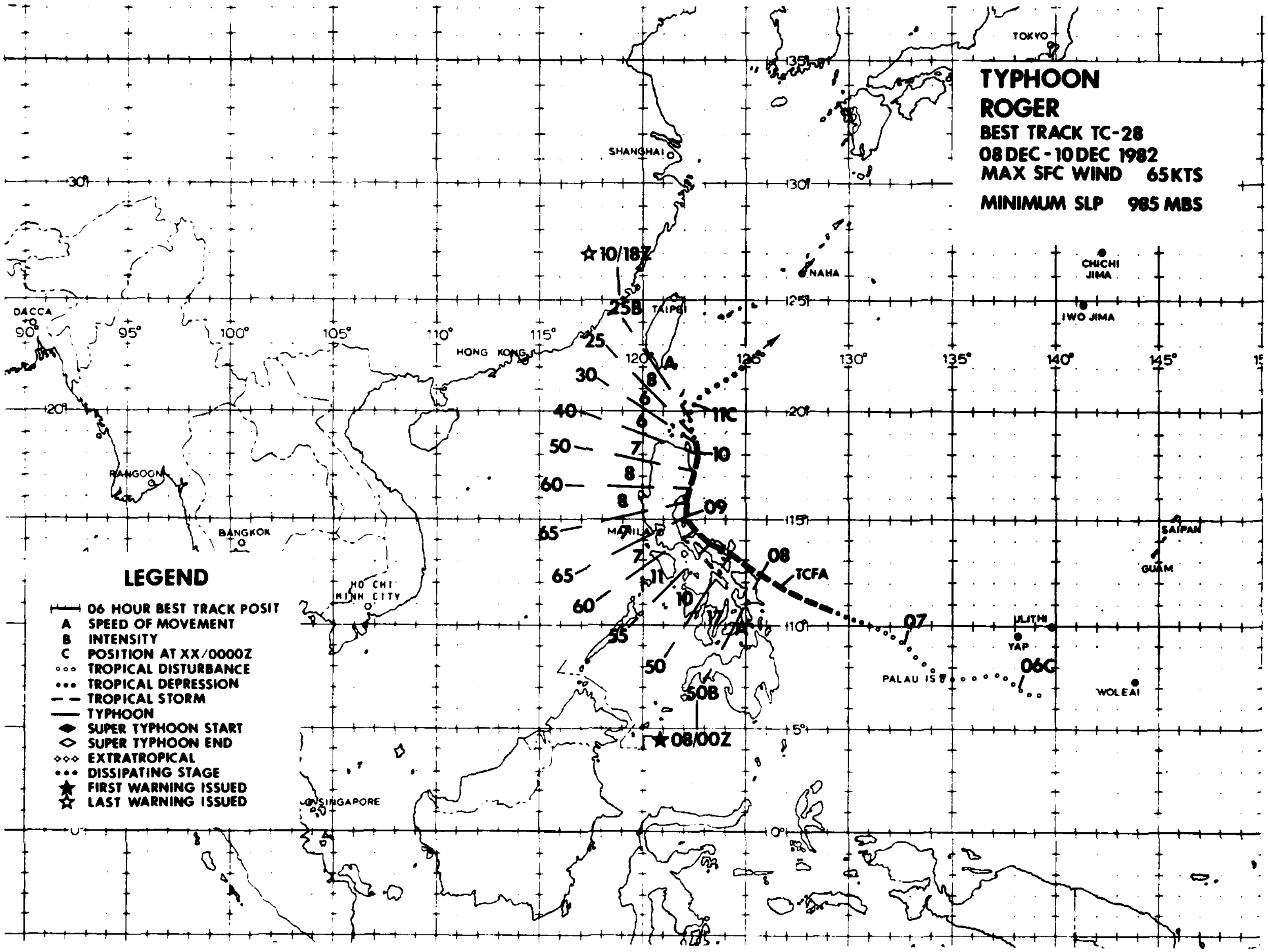


Figure 3-27-2. Pamela, now Tropical Depression 27, with estimated intensity of 30 kts (15 m/sec). 020611Z December (NOAA 7 visual imagery).

fields, from which this scenario was derived, forecast the subtropical ridge to weaken at all levels as a mid-latitude trough deepened in the East China Sea. This meteorological situation would allow Pamela to recurve toward the northeast, accelerate, and undergo an extratropical transition. However, the low-level (850 mb and below) ridge did not weaken as indicated by the prognostic series, and Pamela went on to complete a small anticyclonic loop and moved southwestward toward the Philippines. Early in the loop, Pamela began to interact with the mid-latitude westerlies and once again the effect of increased vertical wind shear weakened Pamela from 80 kt (41 m/sec) to 50 kt (26 m/sec) over a 30-hour period. However, as Pamela moved southwestward, the subtropical ridge to the north began to strengthen at all levels, allowing Pamela to reintensify to a typhoon for the third time. Pamela reached a maximum intensity of 70 kt (36 m/sec) about six hours prior to entering the islands of the central Philippines.

As Pamela moved through the Philippines and weakened, Tropical Depression 28 (Roger) formed in the Philippine Sea. The combined effects of interaction with the topography of the islands and a shift in the low-level wind regime toward Roger caused Pamela to weaken rapidly and eventually brought on its dissipation over the South China Sea.

Figure 3-27-3. Typhoon Pamela, nearly six hours after attaining a second maximum intensity of 80 kts (41 m/sec). To the south, this imagery also shows Typhoon Roger in its formative stages. 050534Z December (NOAA 7 visual imagery).



TYPHOON
ROGER
BEST TRACK TC-28
08 DEC - 10 DEC 1982
MAX SFC WIND 65 KTS
MINIMUM SLP 985 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
DACCA
RANGOON
BANGKOK
HO CHI MINH CITY
SINGAPORE
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
10/18Z
08/00Z
TCFA

Roger was particularly interesting in that it followed closely on the heels of Typhoon Pamela (27). Both systems remained south of the subtropical ridge axis, moved to a mid-tropospheric neutral point near northern Luzon and were profoundly affected by the passage of a mid-latitude trough. In sharp contrast to Pamela, which was a long-lived, significant tropical cyclone, Roger remained an incipient circulation for four days, and required three Tropical Cyclone Formation Alerts (TCFA) before attaining warning status on 7 December.

The first hint of formation occurred at 030600Z when a large area of convection appeared in an upper-level divergence pattern 1200 nm (2222 km) southeast of Typhoon Pamela. This pattern persisted aloft and drifted west-northwestward at 240 nm (444 km) per day. The low-level circulation center was displaced 150 nm (278 km) south of the cloud system center. This incongruity, or tilt, was present until 7 December and was, most probably, responsible for the long period of slow development.

The persistent convection feeding an outflow pattern aloft developed into a cloud system center, which prompted a TCFA at 042000Z and its reissuance for relocation at 050800Z. Development was arrested late on 5 December and the TCFA was cancelled at 060600Z. The upper-level mechanism (troughing off Asia) that was inhibiting Roger's development (in addition to contributing to its vertical tilt) was also affecting Pamela. During this period, Pamela slowed its forward motion, weakened, and changed course from the northwest to the southwest along the periphery of the northeast monsoon. By 061600Z Pamela and (formative) Roger had approached to within 600 nm (1111 km) of each other.

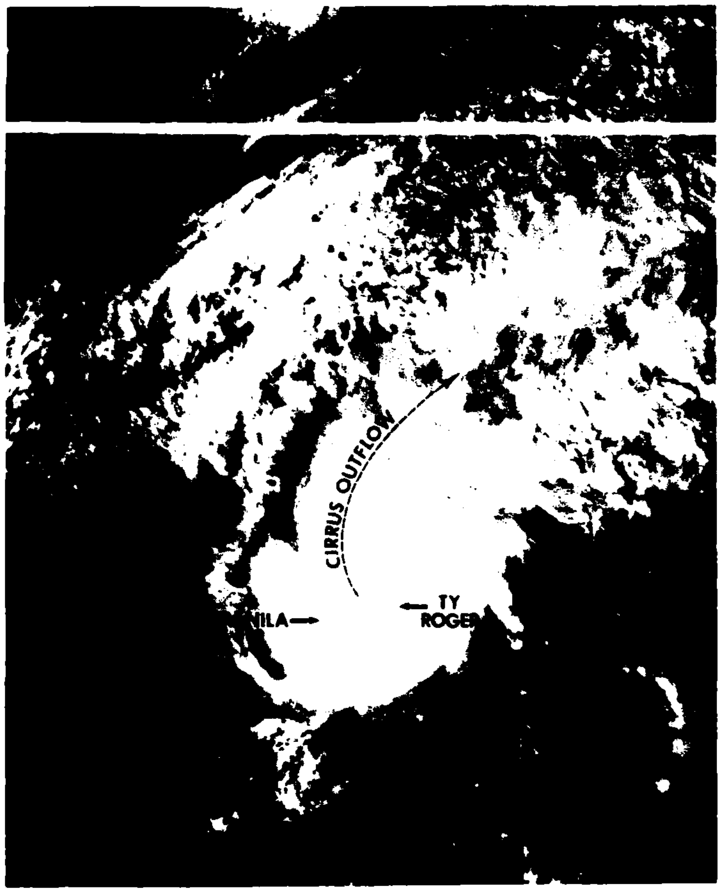


Figure 3-28-1. Expanded visual data of Roger just after reaching typhoon strength off the east coast of Luzon. The extensive low-level cloud deck to the north and northwest of the typhoon's cirrus outflow is embedded in the northeast monsoon. 090627Z December (NOAA 7 visual imagery)

During the next 24 hours the conditions for tropical cyclone development were favorable. Rawinsonde data from southwestern Taiwan (Tung-Chiang, Taiwan (WMO 46747)) indicated a 40 m height rise at 500 mb and reduced vertical wind shear. While Pamela moved into the central Philippines and weakened, Roger remained over water and underwent rapid intensification. The low-level wind circulation center and the cloud system center became vertically aligned and Roger gained tropical storm strength at 071200Z. Because of the sparse conventional data and the system's small maximum wind radius, the Joint Typhoon Warning Center could not verify the change in vertical alignment. As a reconnaissance aircraft deployed, a TCFA was issued at 072000Z. The first fix from the aircraft indicated a small, tight, 50 kt (26 m/sec) circulation with a minimum central pressure of 1002 mb, which prompted the initial warning at 080000Z.

Roger continued to move toward the northwest along the coast of the Philippines and intensified to typhoon strength at 090000Z. At 091200Z the 500 mb heights to the north at Tung-Chiang (WMO 46747) began to fall due to an approaching mid-latitude trough; the 700 mb flow had changed from northerly to southerly and the low-level northeast monsoonal flow weakened. Roger weakened to tropical storm intensity and moved northward along the east coast of northern Luzon. Satellite imagery revealed that a long cirrus plume was developing from Roger and streaming northeastward as the vertical shear increased aloft.

Increasing vertical shear, the approaching trough, and southerly low-level steering flow hinted at both recurvature (with sudden acceleration) and rapid shearing. Because of Roger's close proximity to land, aircraft reconnaissance was unable to monitor which scenario was taking place and, as a result, satellite data became the major input to the warnings. This posed a problem for the satellite analysts who could only position the top of the cloud system, which was becoming featureless and shearing off to the east. By 100600Z the cloud system center had been poorly organized for 12 hours and the apparent location of the low-level circulation center was highly suspect. Fortunately, by this time Roger had sufficient land clearance for the aircraft to be used. The fix located a greatly weakened center just off the northeastern tip of Luzon. These data required amendment of the 100600Z warning; downgrading Roger to a tropical depression, and relocating the circulation center 80 nm (148 km) to the northwest. The increasing vertical shear caused by the mid-latitude trough dropping southeastward across mainland China had disrupted the vertical linkage between the upper- and lower-level circulations and displaced the convection to the southeast.

The remains of the system were monitored for regeneration until 101800Z when the final warning was issued. The exposed low-level center continued to track northeastward for a day and was ingested into the frontogenic zone east of Taiwan.

2. NORTH INDIAN OCEAN TROPICAL CYCLONES

The 1982 North Indian Ocean tropical cyclone season was near normal. Five tropical cyclones reached warning status, two developed during the spring (monsoon) transition season and three developed during the fall transition season. One tropical cyclone developed in the Arabian Sea and the remaining four tropical cyclones developed in the Bay of Bengal. Tables 3-6 through 3-8 provide a summary of North Indian Ocean tropical cyclones, Tropical Cyclone Formation Alerts and Warnings.

TABLE 3-6. NORTH INDIAN OCEAN

1982 SIGNIFICANT TROPICAL CYCLONES

	TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	ESTIMATED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
1.	TC 20-82	2 MAY - 5 MAY	4	14	125	914	1135
2.	TC 22-82	2 JUN - 4 JUN	3	8	55	983	482
3.	TC 23-82	14 OCT - 16 OCT	3	9	50	986	681
4.	TC 24-82	17 OCT - 19 OCT	3	7	50	987	389
5.	TC 25-82	5 NOV - 9 NOV	5	17	90	952	949
		1982 TOTALS:	18	55*			

* IN ADDITON, TWO AMENDED WARNINGS WERE ISSUED DURING 1982

TABLE 3-7.

1982 SIGNIFICANT TROPICAL CYCLONES

NORTH INDIAN OCEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ALL TROPICAL CYCLONES	0	0	0	0	1	1	0	0	0	2	1	0	5
1975-1981													
AVERAGE	.1	-	-	.1	.7	.4	-	-	.4	.9	1.4	.4	4.6
CASES	1	0	0	1	5	3	0	0	3	6	10	3	32

FORMATION ALERTS: Five of the nine Formation Alert Events developed into significant tropical cyclones.

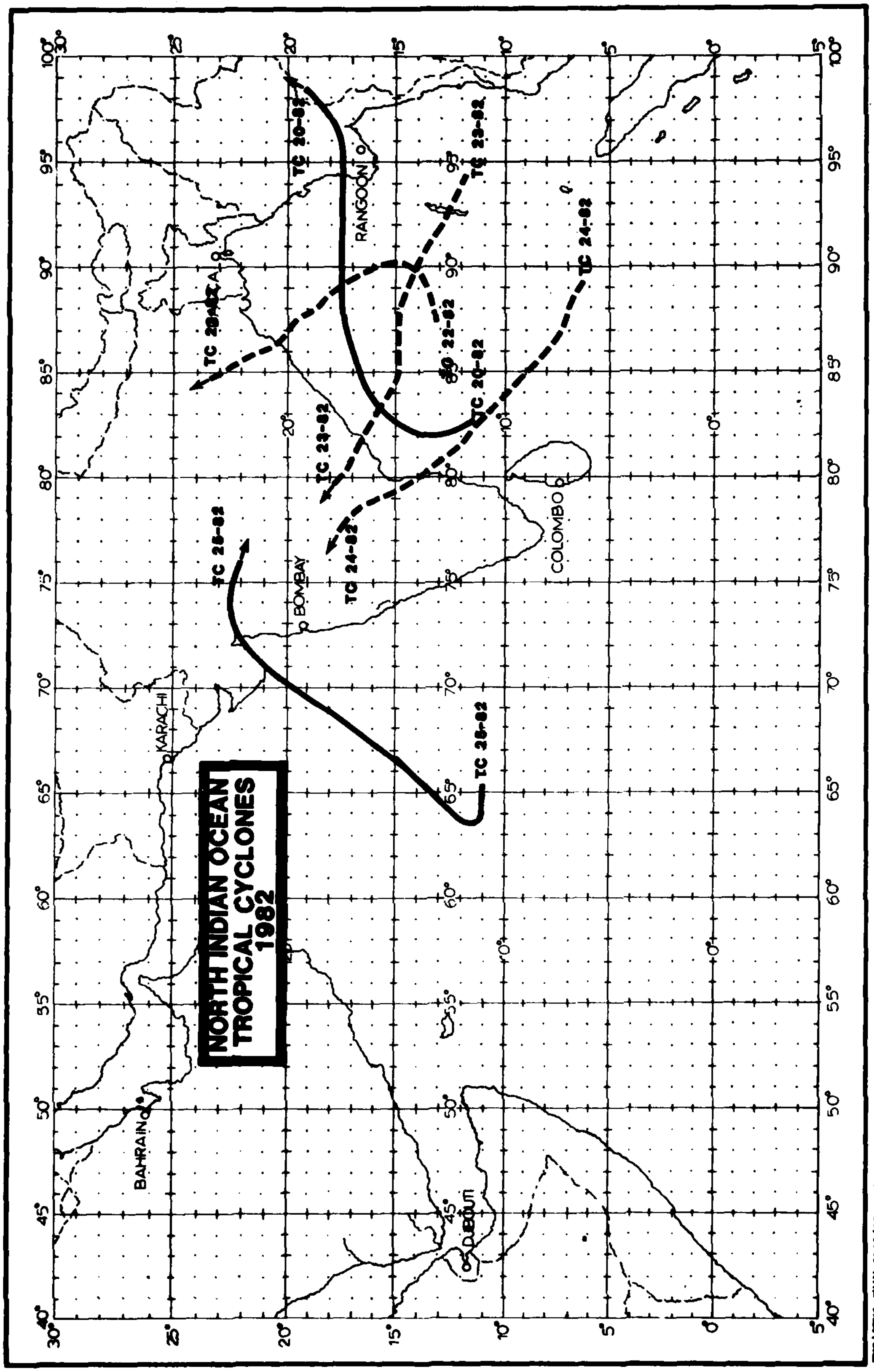
WARNINGS:		
	Number of warning days:	18
	Number of warning days with two tropical cyclones in region:	0
	Number of warning days with three or more tropical cyclones in region:	0

TABLE 3-8.

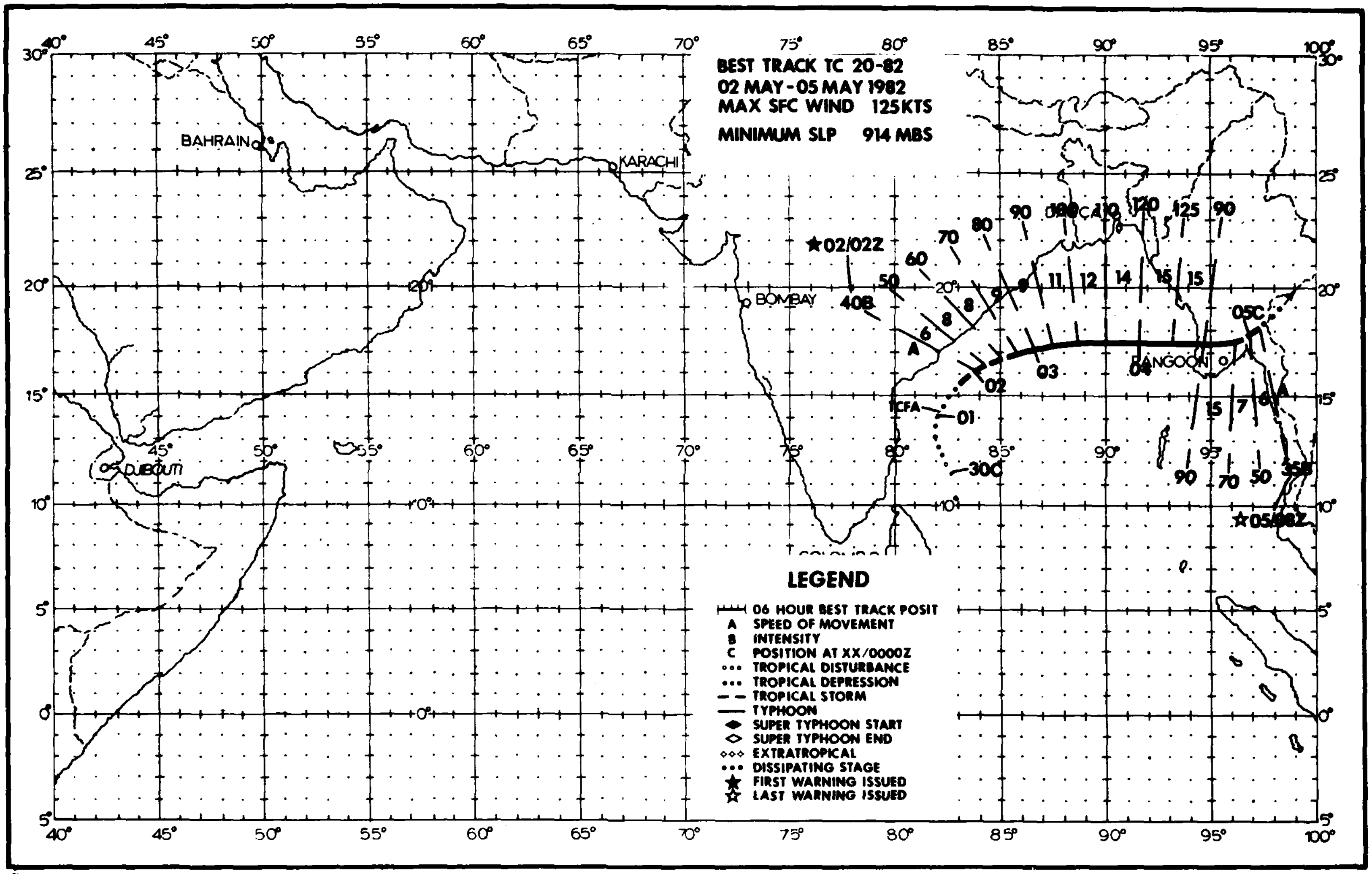
FREQUENCY OF TROPICAL CYCLONES BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1971*	-	-	-	-	-	0	0	0	0	1	1	0	2
1972*	0	0	0	1	0	0	0	0	2	0	1	0	4
1973*	0	0	0	0	0	0	0	0	0	1	2	1	4
1974*	0	0	0	0	0	0	0	0	0	0	1	0	1
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
1976	0	0	0	1	0	1	0	0	1	1	0	1	5
1977	0	0	0	0	1	1	0	0	0	1	2	0	5
1978	0	0	0	0	1	0	0	0	0	1	2	0	4
1979	0	0	0	0	1	1	0	0	2	1	2	0	7
1980	0	0	0	0	0	0	0	0	0	0	1	1	2
1981	0	0	0	0	0	0	0	0	0	1	1	1	3
1982	0	0	0	0	1	1	0	0	0	2	1	0	5
1975-1982													
AVERAGE	.1	-	-	.1	.8	.5	-	-	.4	1.0	1.4	.4	4.6
CASES	1	0	0	1	6	4	0	0	3	8	11	3	37

* JTWC warning responsibility began on 4 June 1971 for the Bay of Bengal, east of 90E. As directed by CINCPAC, JTWC issued warnings only for those tropical cyclones that developed or tracked through that portion of the Bay of Bengal. Commencing with the 1975 tropical cyclone season, JTWC's area of responsibility was extended westward to include the western portion of the Bay of Bengal and the entire Arabian Sea.



FWC/JTWC GUAM 3142/62 (NEW 2-76)



FWC/JTWC GUAM 3142/62 (NEW 2-76)

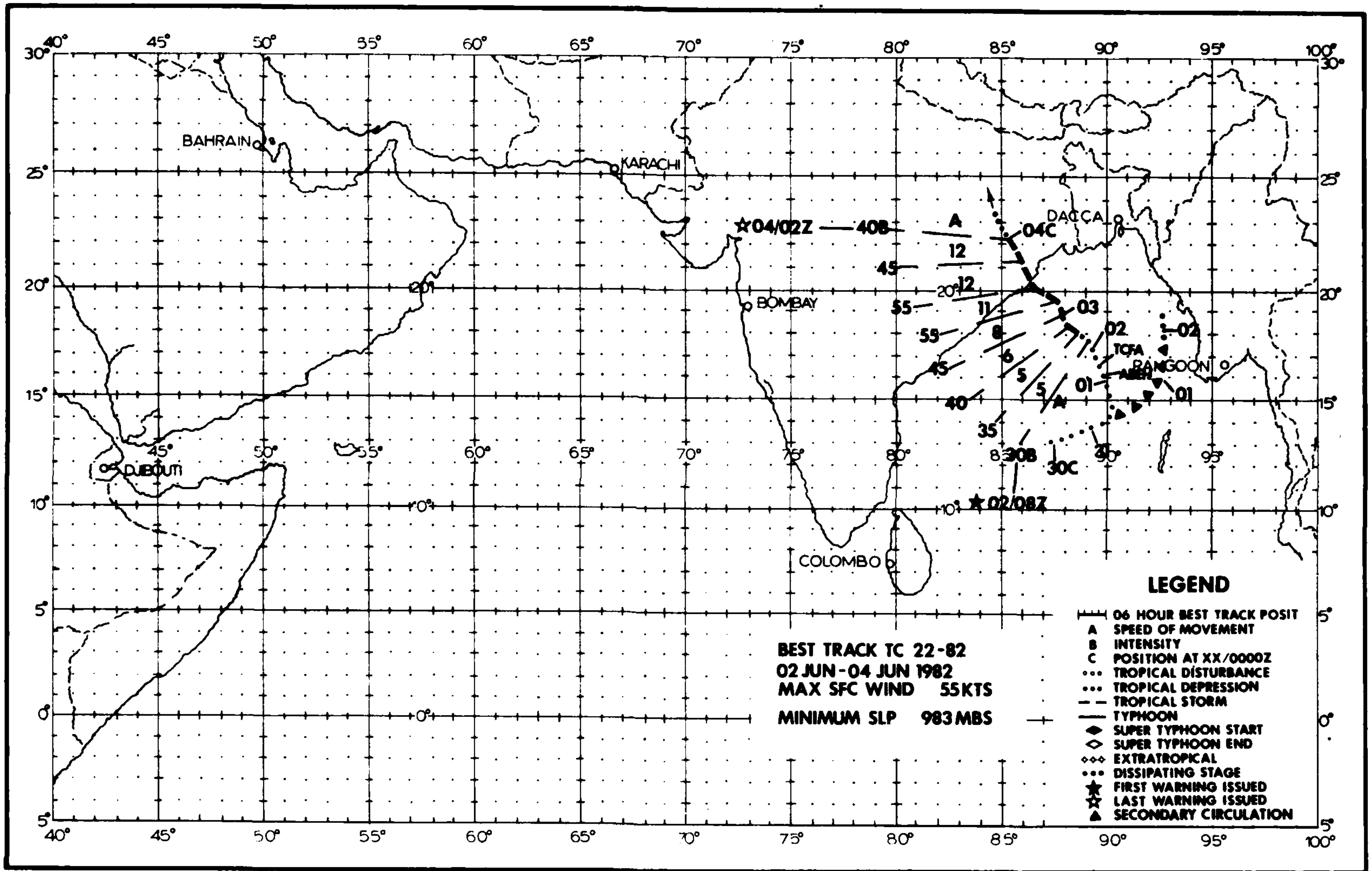
During late April, the monsoon trough was anchored in the latitudes south of Sri Lanka and extended eastward into the central portion of the Bay of Bengal. On 26 April, an area of convection associated with this trough became suspect and was discussed in the Significant Tropical Weather Advisory (ABEH PGTW); however, center fixes from satellite data were not available until 30 April when an upper-level circulation center was analyzed over the convection. On 1 May, a Tropical Cyclone Formation Alert was issued as a central dense overcast (CDO) formed over the system.

During this period, there was some concern about the actual intensity of the system at the surface. Surface observations from India, Sri Lanka, and throughout the Bay of Bengal indicated light and variable winds close to the developing system and the strongest winds (15 to 20 kt (8 to 10 m/sec)) far removed from the convection. Additionally, satellite fixes lacked continuity in tracking the system and the possibility that a significant surface circulation had not yet established itself seemed very realistic. However, NOAA 7 satellite imagery at 012132Z, received and analyzed at Air Force Global Weather Central (AFGWC), indicated a substantial increase in the system's convective organization, which prompted the issuance of the first warning for Tropical Cyclone 20-82 at 020200Z. From the initial warning position 440 nm (815 km) north-northeast of Sri Lanka, Tropical Cyclone 20-82 moved northeastward, remaining approximately 120 nm (222 km) east of India. Fix positions remained somewhat erratic in the early stages but improved when satellite imagery (021327Z NOAA 7) indicated that an eye had developed. The appearance of the eye also laid to rest any lingering doubts as to whether Tropical Cyclone 20-82 had developed into a significant tropical cyclone.

Track forecasts for Tropical Cyclone 20-82 were very good. From the first warning, Tropical Cyclone 20-82 was expected to move northeastward and turn more eastward with time. As Tropical Cyclone 20-82 approached 18N, it's movement became virtually eastward across the Bay of Bengal until landfall. While crossing the Bay of Bengal, Tropical Cyclone 20-82 continued to intensify and reached an estimated maximum intensity of 125 kt (64 m/sec) just prior to landfall. Best track intensities were based almost exclusively on Dvorak intensity estimates received from AFGWC and from Detachment 1,1WW, Nimitz Hill, Guam. However, despite the absence of verifying synoptic reports, satellite imagery (Figure 3-29-1) and later, casualty reports from Burma were convincing evidence that Tropical Cyclone 20-82 was a very intense (although quite compact) tropical cyclone.

The value of the meteorological satellite, especially in data sparse regions, has once again proven itself. In the era prior to the availability of imagery from satellites, Tropical Cyclone 20-82 would have been an undetected storm of great intensity that would strike without warning. A news release from Rangoon, Burma on 6 May, reported 7,000 homes destroyed in one township, and 85% of the homes and buildings in another township had their roofs blown away. Elsewhere, along Tropical Cyclone 20-82's path, schools, industries and hospitals were damaged or destroyed. Yet despite this extensive destruction, there were just five deaths reported in a region of the world where loss of human life is frequently in the hundreds from the effects of tropical cyclones.

Figure 3-29-1. Tropical Cyclone 20-82 near maximum intensity, just west of Burma, 050423Z May. (NOAA 7 visual satellite imagery from AFGWC, Offutt, AFB, Nebraska)



FWC/JTWC GUAM 3142/62 (NEW 2-76)

Tropical Cyclone 22-82 was the second significant tropical cyclone to develop in the Bay of Bengal during the spring (monsoon) transition season. During the last week of May, there was considerable convective activity over the central Bay of Bengal, resulting in two Tropical Cyclone Formation Alerts (TCFA) that were issued for a disturbance which tracked northeastward and moved into Burma on 29 May.

At 290000Z, a new convective area could be detected on satellite imagery moving out of a monsoon cloud band near 9N in the central Bay. During the ensuing three days, the convective area drifted northward with little evidence of a closed surface circulation. The synoptic environment in the Bay of Bengal at this time was dominated by strong (30 to 40 kt (15 to 21 m/sec)) westerly flow south of 9N, and by a 996 mb heat low over northern India.

By 010600Z June, the convective mass became more organized as an upper-level anticyclone could be analyzed from synoptic data, while visual satellite imagery revealed an exposed low-level circulation some 120 nm (222 km) to the northeast of the convective area. During the next 12 hours, satellite imagery indicated continued convective organization and at 011835Z, a TCFA was issued with the stipulation that the potential for significant tropical cyclone development was good, provided that either the low-level and upper-level features became better aligned or a new circulation developed under the convection. By 020800Z, when satellite data suggested that the latter case had occurred (the convective system had continued to develop and the exposed low-level circulation could no longer be detected on visual imagery), the first warning was issued for Tropical Cyclone 22-82.

During its short lifetime, Tropical Cyclone 22-82 followed a fairly straight, and climatological, northwestward track. Initially moving at 5 kt (9 km/hr), Tropical Cyclone 22-82 steadily increased it forward speed to 12 kt (22 km/hr) and intensified until making landfall at 031400Z. Satellite data from Air Force Global Weather Central (AFGWC) (Figure 3-30-1) and radar reports received at the Indian regional forecast center, indicated that Tropical Cyclone 22-82 was developing an eye when landfall was made just north of Paradip, 150 nm (278 km) southeast of Calcutta. In the coastal districts near Paradip and Orissa, where the tropical cyclone hit hardest, casuality reports indicated that more than 140 people were killed and more than 500,000 homes were destroyed. After landfall, Tropical Cyclone 22-82 rapidly dissipated as it tracked into the extreme southern portion of the Ganges River Valley.

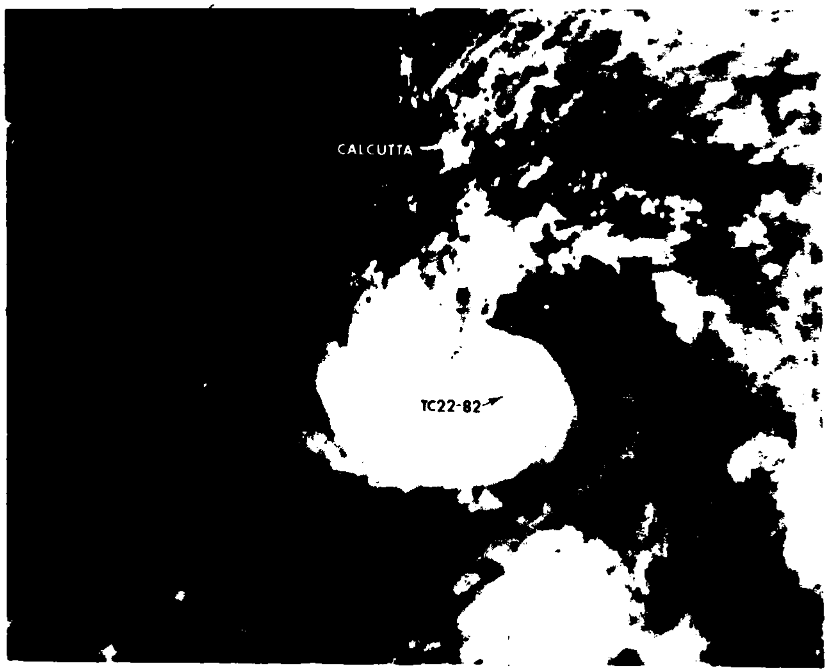
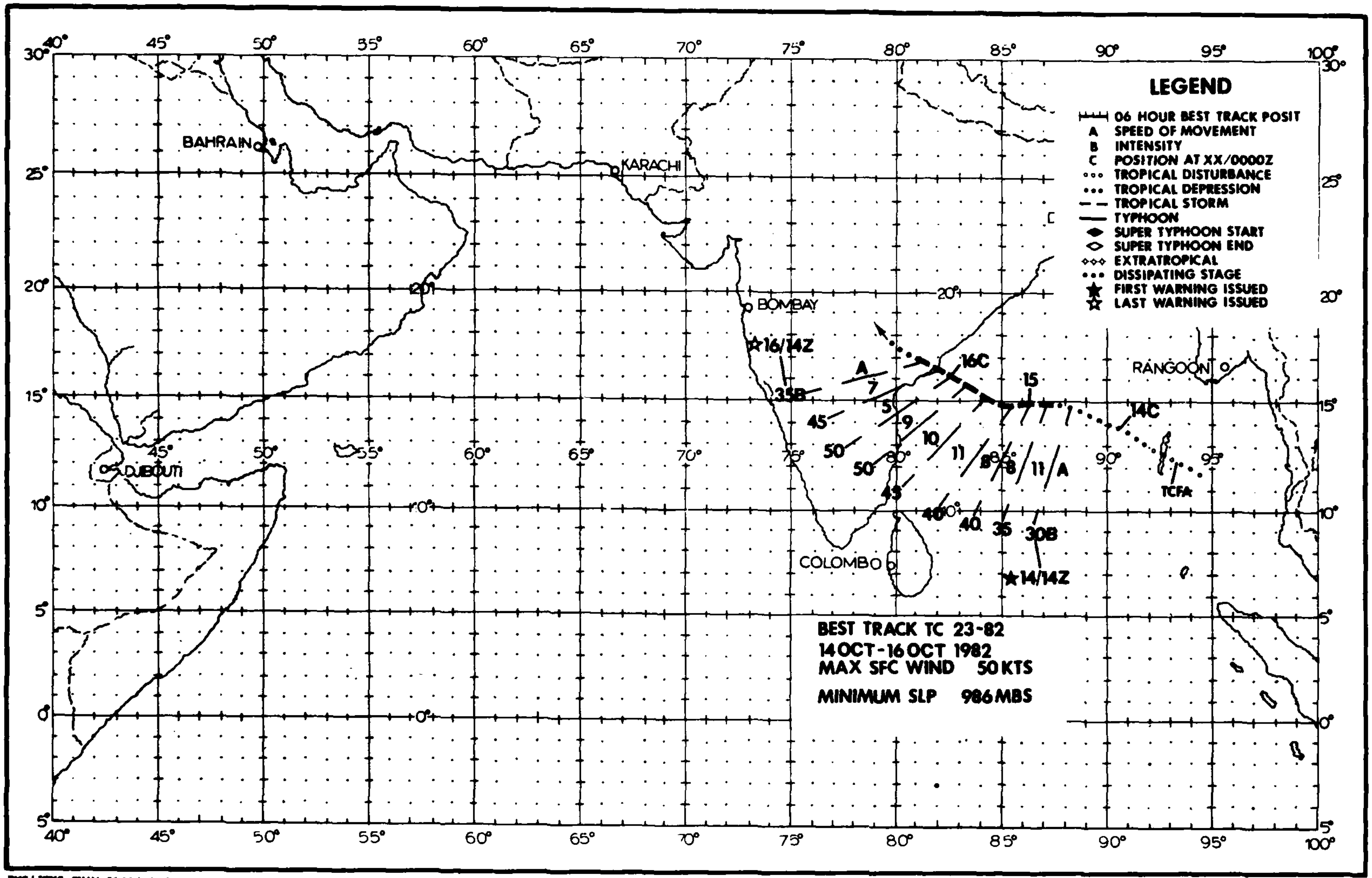


Figure 3-30-1. Tropical Cyclone 22-82 about five hours prior to landfall with an irregular 15 nm (28 km) eye near the center of the central dense overcast, 030858Z June (NOAA 7 visual satellite imagery from AFGWC, Offutt AFB, Nebraska).



FWC/JTWC GUAM 3142/62 (NEW 2-76)

The initial stages of Tropical Cyclone 23-82's development were characterized by a persistent upper-level anticyclone and a weak surface disturbance associated with a broad area of convection. Initially detected on 9 October, JTWC tracked a westward-moving surface circulation from the Gulf of Thailand across the Malay Peninsula. Little development was evident from synoptic or satellite data as the system entered the southern Bay of Bengal. On 13 October, convection began to increase and show signs of organization while the system moved west of the Andaman Islands. A Tropical Cyclone Formation Alert was issued at 130600Z when satellite imagery revealed that the system's convection had organized under a more distinctly defined upper-level anticyclone. Late on 14 October satellite imagery showed that a strong central convective feature had developed and that upper-level outflow had increased. Based on these data, and the expectation of further development, the initial warning was issued at 141400Z for Tropical Cyclone 23-82.

The forecast tracks issued throughout Tropical Cyclone 23-82's lifespan anticipated movement toward the west-northwest in response to a mid-level steering current induced by a subtropical ridge centered over Burma. Tropical Cyclone 23-82 proved to be a "well-behaved" system and followed the forecast track toward the east coast of India. While in warning status Tropical Cyclone 23-82 gradually intensified and reached a peak intensity of 50 kt (26 m/sec) six hours prior to landfall. At approximately 161200Z, Tropical Cyclone 23-82 passed 35 nm (65 km) south of Kakinada, India (WMO 43189) with observed maximum sustained winds of 20 kt (10 m/sec). From Kakinada, Tropical Cyclone 23-82 proceeded inland and gradually dissipated.

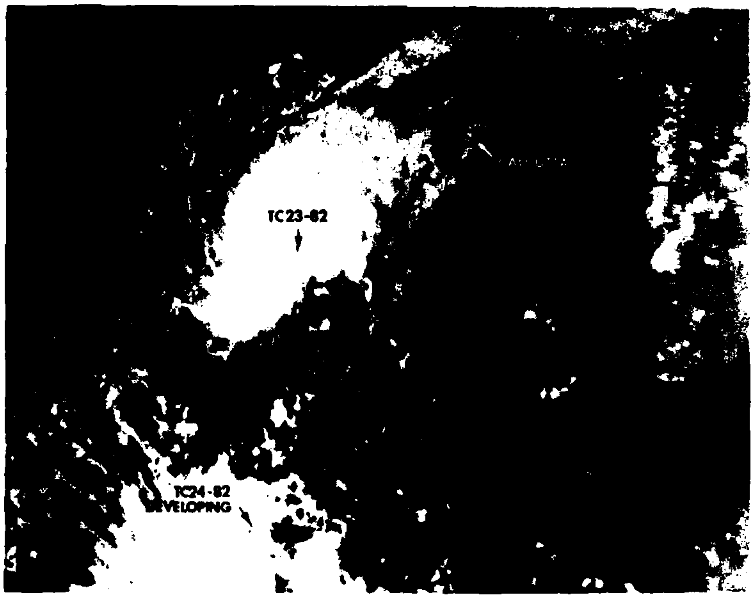
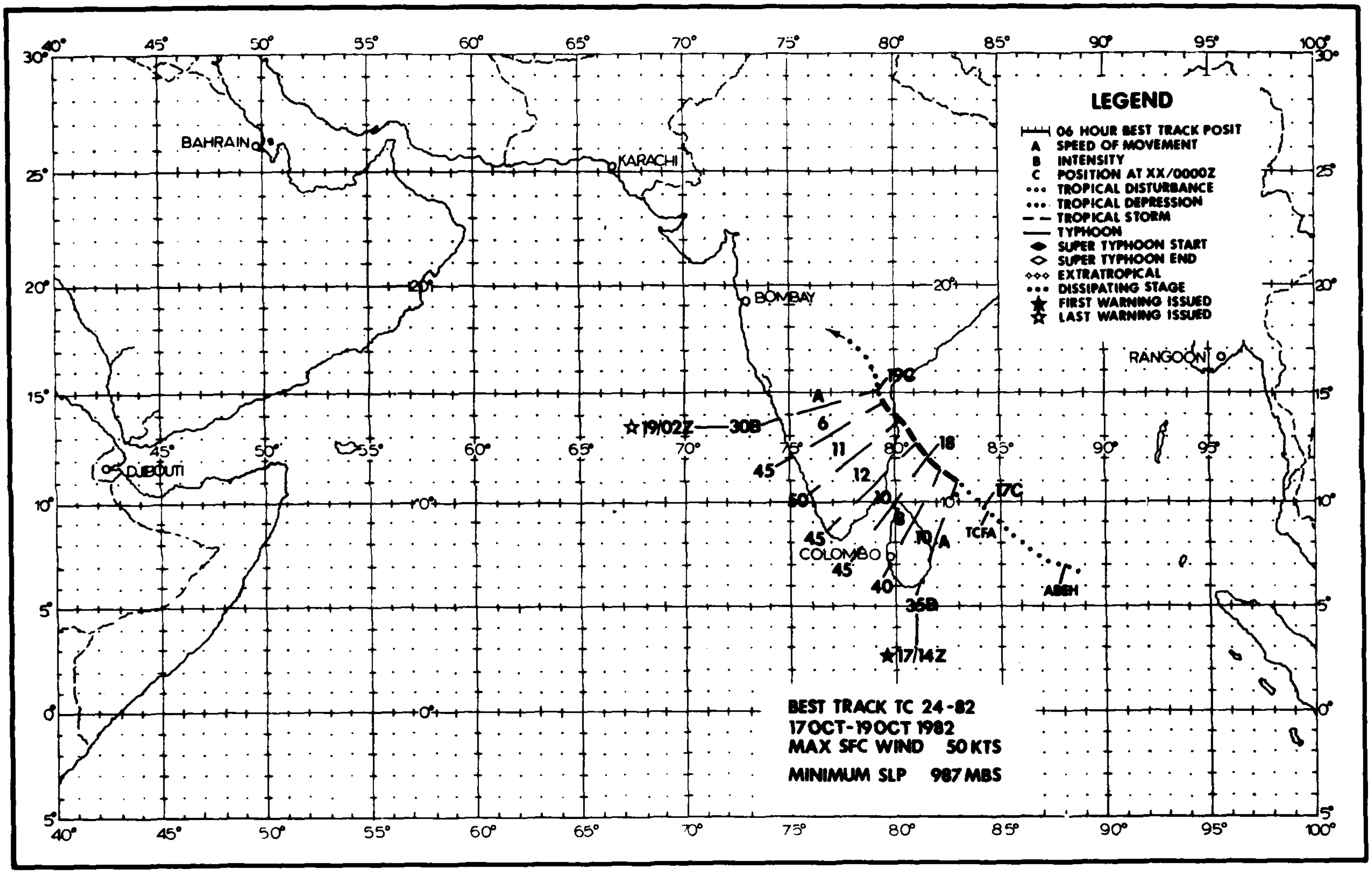


Figure 5-31-1. Tropical Cyclone 23-82 near landfall along the east coast of India with surface winds near 45 kt (23 m/sec). Tropical Cyclone 24-82 can be seen in its formative stages near Sri Lanka, 160856Z October (NOAA 7 visual imagery from AFGWC Offutt AFB, Nebraska).



FWC/JTWC GUAM 3142/62 (NEW 2-76)

Tropical Cyclone 24-82 developed from an area of convective activity first observed on 15 October about 400 nm (740 km) east of Sri Lanka in the Bay of Bengal. No surface circulation was present but a weak upper-level anticyclone was evident on satellite imagery. During the next two days, the area was monitored for further development as it drifted slowly to the northwest. On the 16th, synoptic data and satellite imagery indicated that a loosely organized surface circulation had developed. In combination with the upper-level anticyclone, this circulation was considered to have good potential for intensification and a Tropical Cyclone Formation Alert was issued at 162300Z.

Subsequent satellite imagery indicated that the circulation had come together at the surface and mid-levels. JTWC issued the first warning on Tropical Cyclone 24-82 at 171400Z. Mid-level steering flow at the time was from the southeast due to the presence of a 500 mb anticyclone over Indochina. Numerical forecast products indicated that this mid-level anticyclone would retain its intensity and location throughout the ensuing 72 hours, thus, Tropical Cyclone 24-82 was forecast to continue moving northwestward. The system did move as expected, making landfall near Sriharikota Island at 181400Z with maximum sustained winds of 50 kt (26 m/sec).

Damage to private dwellings in Nellore District was extensive with an estimated 10,000 collapsed huts. Casualties were reported to be 5 dead and 10 injured. Tropical Cyclone 24-82 continued drifting northwestward after landfall and dissipated over central India.

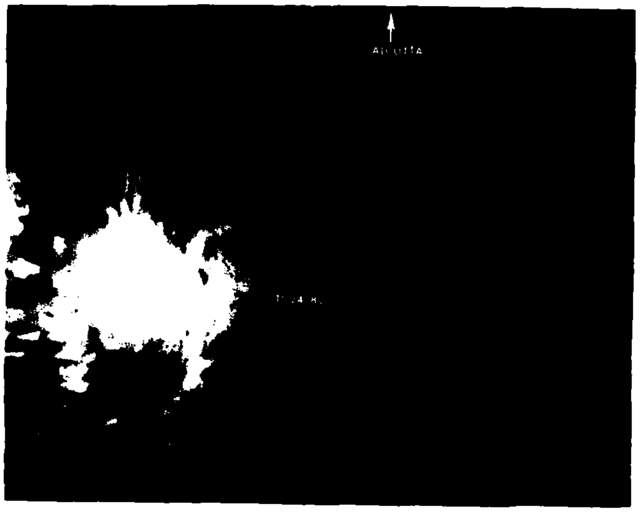
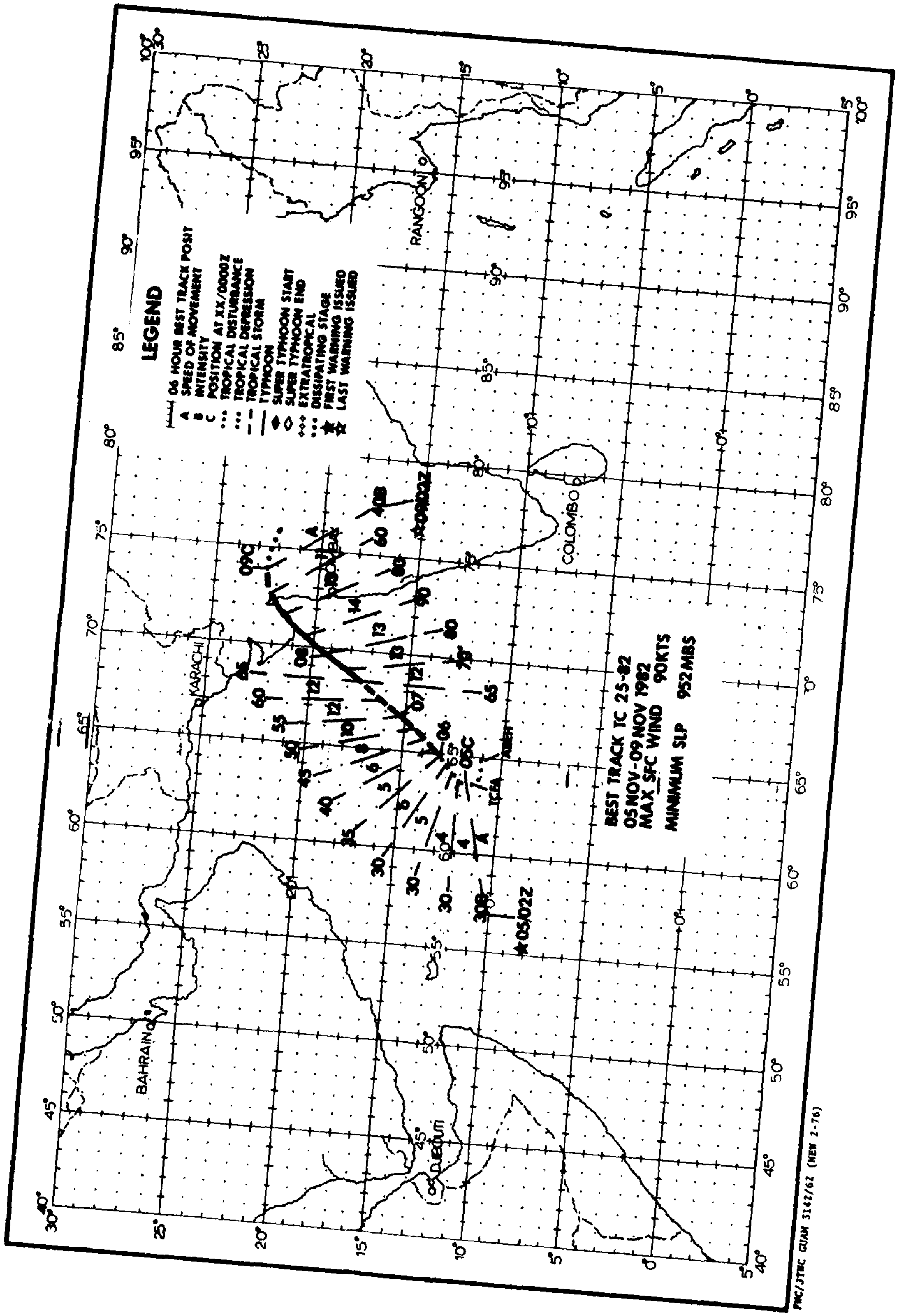


Figure 3-32-1. This satellite imagery indicated Tropical Cyclone 24-82 had organized sufficiently to warrant the issuance of tropical cyclone warnings. 170843Z October (NOAA 7 visual imagery from AFGWC Offutt AFB, Nebraska).


LEGEND
06 HOUR BEST TRACK POSIT
SPEED OF MOVEMENT
INTENSITY
POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
BEST TRACK TC 25-82
05 NOV-09 NOV 1982
MAX SFC WIND 90KTS
MINIMUM SLP 952 MBS
KARACHI
BAHRAIN
DJIBOUTI
COLOMBO
RANGOON
05/02Z
09/02Z
FWC/JTWC GUAM 3142/62 (NEW 2-76)

Tropical Cyclone 25-82 developed from an area of loosely organized convection in the central Arabian Sea. Although satellite images indicated that the convection and cloud system organization were increasing, shipboard synoptic reports were the first data to accurately describe the low-level circulation center. At 042000Z November, a Tropical Cyclone Formation Alert was issued when nearby shipboard observations indicated pressures near 1004 mb and winds of 20 kt (10 m/sec), confirming intensity estimates from earlier satellite data. Satellite and synoptic data during the subsequent 12-hour period indicated that development was continuing, prompting the first warning on Tropical Cyclone 25-82 at 050200Z.

Tropical Cyclone 25-82 slowly consolidated during the initial 24-hour period in warning status. Based on guidance from virtually every forecast aid, the first six warnings anticipated a movement toward the west-northwest. However, once the system organized and satellite fixes became more consistent, it became evident that Tropical Cyclone 25-82 was not moving westward as forecast. In the same time frame, a break developed in the mid-level subtropical ridge, which lay along 23N. As height falls occurred across the northern Arabian Sea coast, the tropical cyclone responded by accelerating toward the northeast and intensifying. Tropical Cyclone 25-82 continued to deepen until landfall at 081000Z near the Indian port city of Veraval (20.9N 70.4E). Veraval was particularly hard hit as the cyclone moved onshore with sustained winds of 90 kt (46 m/sec).

Once overland, and deprived of the low-level moist layer over water, Tropical Cyclone 25-82 rapidly dissipated, leaving in its wake at least 50,000 homes damaged or destroyed and a death toll in excess of 341.

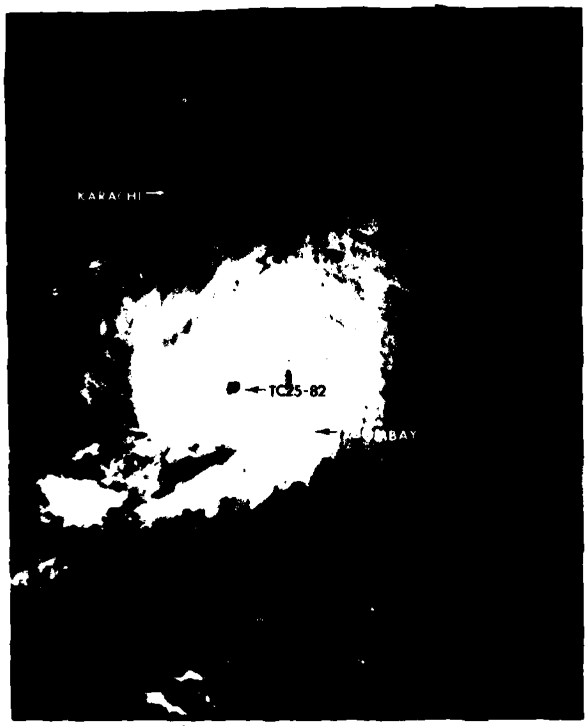


Figure 3-33-1. Tropical Cyclone 25-82 is at peak intensity with maximum winds of 90 kt (46 m/sec) and just making landfall on India's northwestern coast. 080921Z November (NOAA 7 visual imagery from AFGWC Offutt AFB, Nebraska)

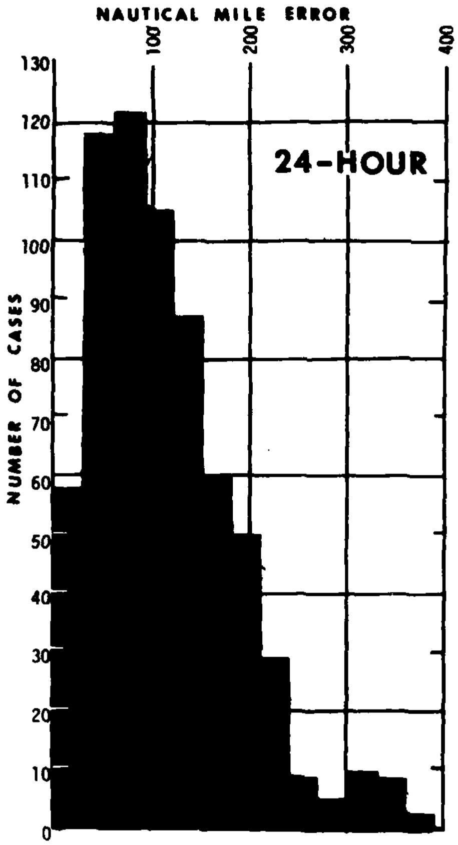
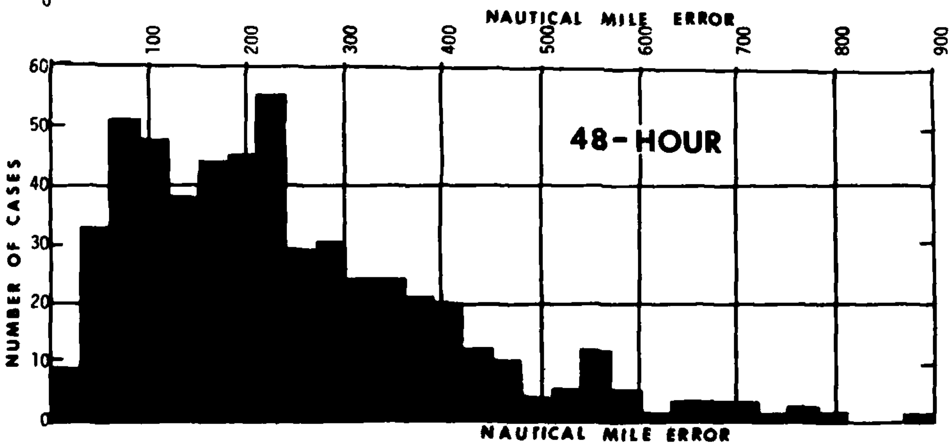
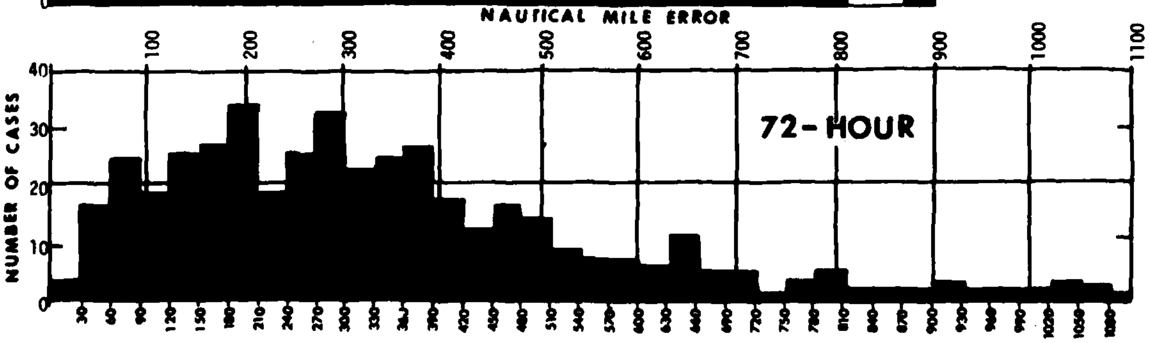


FIGURE 4-2. *Frequency distribution of the 24-, 48-, and 72-hour forecast errors for all significant tropical cyclones in the western North Pacific during the 1982 season.*

FORECAST ERRORS (nm)

	24-HR	48-HR	72-HR
MEAN:	113	237	341
MEDIAN:	98	209	296
STANDARD DEVIATION:	73	158	225
CASES:	665	535	428





CHAPTER IV – SUMMARY OF FORECAST VERIFICATION

1. ANNUAL FORECAST VERIFICATION

a. Western North Pacific Ocean

The positions given for warning times and those at the 24-, 48-, and 72-hour forecast times were verified against the post-analysis "best-track" positions at the same valid times. The resultant vector and right angle (track) errors (illustrated in Figure 4-1) were then calculated for each tropical cyclone and are presented in Table 4-1. Figure 4-2 provides the frequency distributions of vector errors for 24-, 48- and 72-hour forecasts of all 1982 tropical cyclones in the western North Pacific. A summation of the mean errors, as calculated for all tropical cyclones in each year, is shown in Table 4-2 for comparative purposes. The data used in this table are not to be confused with that presented in earlier years where the sample was restricted to tropical cyclones that reached typhoon intensity and then had the forecast errors calculated only for that portion of the life-cycle when the intensity was greater than 34 knots (last published as Table 5-1, 1977 Annual Typhoon Report). A comparison of the results using the truncated data set and those obtained for all tropical cyclones can be seen directly in Table 4-3. The annual mean vector errors are graphed in Figure 4-3.

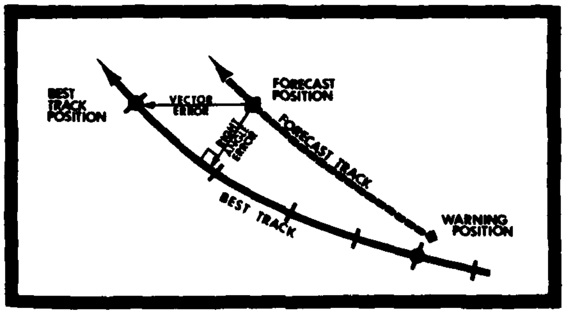


FIGURE 4-1. *Illustration of the method to determine vector error and right angle error.*

TABLE 4-1.

FORECAST ERROR SUMMARY FOR THE WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES OF 1982. (ERRORS IN NM)

		WARNING			24-HOUR			48-HOUR			72-HOUR		
		POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS
1.	TY MAMIE	25	14	35	93	48	32	188	86	24	276	115	23
2.	TY NELSON	24	13	53	95	57	49	180	116	44	170	72	37
3.	TY ODESSA	29	16	25	228	113	21	520	226	17	742	385	13
4.	TY PAT	28	24	23	149	134	19	299	237	15	583	394	11
5.	TY RUBY	27	12	23	144	64	19	275	143	15	425	326	11
6.	TS TESS	15	9	14	107	73	10	217	142	3	144	41	1
7.	TS SKIP	16	15	7	95	32	3						
8.	TS VAL	29	22	5	363	33	1						
9.	TS WINONA	22	13	21	100	42	16	175	93	13	224	121	9
10.	TY ANDY	24	14	32	99	50	28	168	106	23	231	144	19
11.	STY BESS	18	13	43	121	64	39	267	122	35	396	198	31
12.	TY CECIL	14	9	39	102	41	33	172	75	30	219	141	23
13.	TY DOT	22	17	27	108	68	24	218	172	20	262	208	16
14.	TY ELLIS	14	8	36	76	42	32	171	81	26	263	153	22
15.	TY FAYE	18	8	50	142	49	41	384	273	33	639	445	27
16.	TY GORDON	15	11	38	100	63	34	214	101	30	364	210	26
17.	TS HOPE	19	9	10	186	79	6	426	118	2			
18.	TY IRVING	13	9	44	73	42	40	110	72	35	172	126	32
19.	TY JUDY	19	15	29	125	73	25	298	126	19	401	262	13
20.	TY KEN	15	9	37	75	49	33	201	134	29	344	263	25
21.	TS LOLA	21	16	12	88	68	8	232	152	4			
22.	TD 22	35	21	5	155	83	1						
23.	STY MAC	14	13	32	90	63	28	162	104	24	294	149	20
24.	TY NANCY	12	10	29	86	74	26	213	175	21	430	333	17
25.	TD 25	35	33	5	113	119	1						
26.	TY OWEN	24	18	40	146	103	32	364	236	24	550	285	18
27.	TY PAMELA	20	14	60	139	79	56	263	149	45	280	140	34
28.	TY ROGER	17	17	12	129	116	8	383	329	4			
ALL FORECASTS:		19	13	786	113	67	665	237	139	535	341	206	428

TABLE 4-2. ANNUAL MEAN FORECAST ERRORS (NM) FOR THE WESTERN PACIFIC

	24-HOUR		48-HOUR		72-HOUR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971	111	64	212	118	317	117
1972	117	72	245	146	381	210
1973	108	74	197	134	253	162
1974	120	78	226	157	348	245
1975	138	84	288	181	450	290
1976	117	71	230	132	338	202
1977	148	83	283	157	407	228
1978	127	75	271	179	410	297
1979	124	77	226	151	316	223
1980	126	79	243	164	389	287
1981*	123	75	220	119	334	168
1982*	113	67	237	139	341	206

* The technique for calculating right angle error was revised in 1981; therefore, a direct correlation in right angle statistics cannot be made for the errors computed before 1981 and the errors computed since 1981.

TABLE 4-3. ANNUAL MEAN FORECAST ERRORS (NM) FOR WESTERN NORTH PACIFIC

	24-HOUR		48-HOUR		72-HOUR	
YEAR	ALL	TYPHOON*	ALL	TYPHOON*	ALL	TYPHOON*
1950-58		170				
1959		117**		267**		
1960		177**		354**		
1961		136		274		
1962		144		287		476
1963		127		246		374
1964		133		284		429
1965		151		303		418
1966		136		280		432
1967		125		276		414
1968		105		229		337
1969		111		237		349
1970	104	98	190	181	279	272
1971	111	99	212	203	317	308
1972	117	116	245	245	381	382
1973	108	102	197	193	253	245
1974	120	114	226	218	348	351
1975	138	129	288	279	450	442
1976	117	117	230	232	338	336
1977	148	140	283	266	407	390
1978	127	120	271	241	410	459
1979	124	113	226	219	316	319
1980	126	116	243	221	389	362
1981	123	117	220	215	334	342
1982	113	114	237	229	341	337

* For Typhoons only while winds were over 35 kt (18 m/sec).

** Forecast positions north of 35°N were not verified.

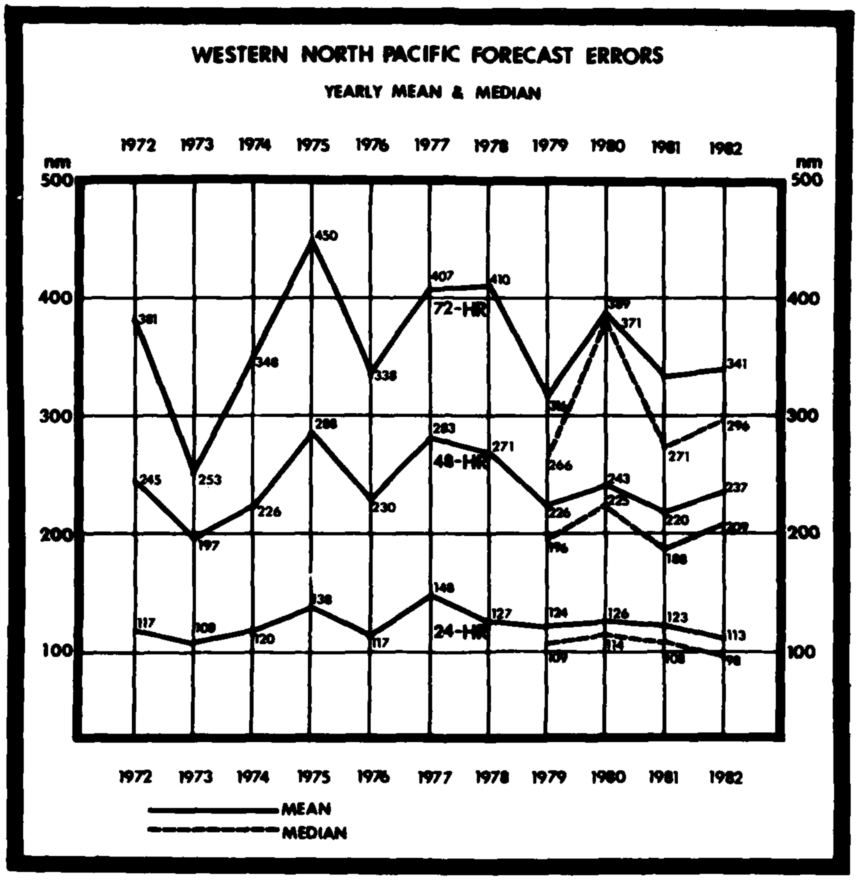


FIGURE 4-3. Annual mean and median vector errors (nm) for all tropical cyclones in the western North Pacific.

b. North Indian Ocean

The positions given for warning times and those at the 24-, 48- and 72-hour valid times were verified for tropical cyclones in the North Indian Ocean by the same methods used for the western North Pacific. It should be noted that due to the low number of North Indian Ocean tropical cyclones, these error statistics should not be taken as representative of any trend. Table 4-4 is the forecast error summary for the North Indian Ocean and Table 4-5 contains the annual average of forecast errors back through 1971. Vector errors are plotted in Figure 4-4. (Seventy-two hour forecast errors were evaluated for the first time in 1979).

TABLE 4-4.

FORECAST ERROR SUMMARY FOR THE NORTH INDIAN OCEAN
SIGNIFICANT TROPICAL CYCLONES OF 1982. (ERRORS IN NM)

	WARNING			24-HOUR			48-HOUR			72-HOUR		
	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS	POSIT ERROR	RT ANGLE ERROR	NR OF WRNGS
1. TC 20-82	23	14	14	118	43	10	283	87	6	340	116	2
2. TC 22-82	22	16	8	106	36	5	238	85	1			
3. TC 23-82	34	18	9	88	49	6	151	86	2			
4. TC 24-82	22	15	7	68	22	3						
5. TC 25-82	55	34	17	205	113	13	487	264	9	931	519	5
ALL FORECASTS:	35	21	55		66	37	368	175	18	762	404	7

TABLE 4-5.

ANNUAL MEAN FORECAST ERRORS FOR THE NORTH INDIAN OCEAN

	24-HOUR		48-HOUR		72-HOUR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971*	232	-	410	-	-	-
1972*	224	101	292	112	-	-
1973*	182	99	299	160	-	-
1974*	137	81	238	146	-	-
1975	145	99	228	144	-	-
1976	138	108	204	159	-	-
1977	122	94	292	214	-	-
1978	133	86	202	128	-	-
1979	151	99	270	202	437	371
1980	115	73	93	87	167	126
1981**	109	65	176	103	197	73
1982**	138	66	368	175	762	404

* The western Bay of Bengal and the Arabian Sea were not included in the JTWC area of responsibility until the 1975 tropical cyclone season.

** The technique for calculating right angle error was revised in 1981; therefore, a direct correlation in right angle statistics cannot be made for the errors computed before 1981 and the errors computed since 1981.

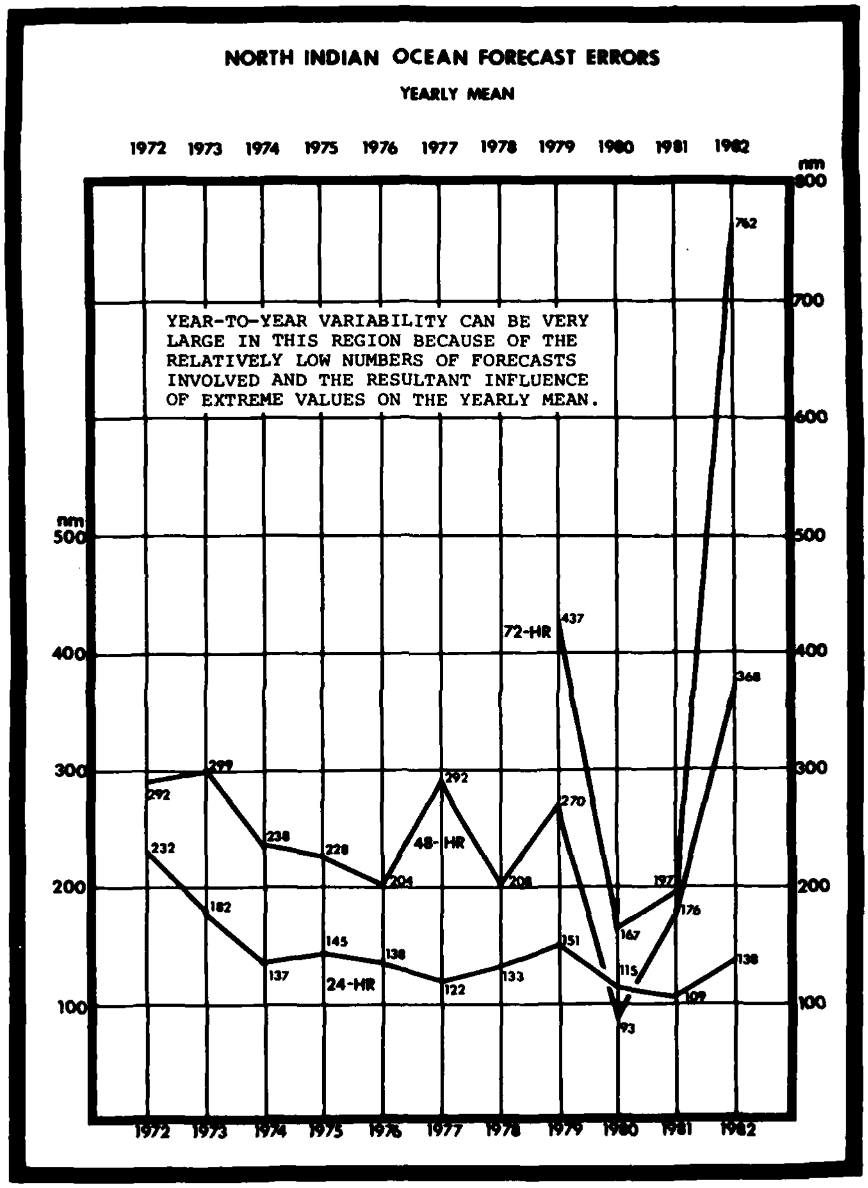


FIGURE 4-4. *Annual mean vector errors (nm) for all tropical cyclones in the North Indian Ocean.*

2. COMPARISION OF OBJECTIVE TECHNIQUES

a. General

Objective techniques used by JTWC are divided into five main categories:

(1) climatological and analog techniques;

(2) extrapolation;

(3) steering techniques;

(4) dynamic models;

(5) empirical and analytical techniques

In September 1981, JTWC began to initialize its array of objective forecast techniques (described below) on the six-hour-old preliminary best track position (an interpolative process) rather than the forecast (partially extrapolated) warning position, e.g. the 0600Z warning is now supported by objective techniques developed from the 0000Z preliminary best track position. This operational change has yielded several advantages:

*techniques can now be requested much earlier in the warning development time line, i.e. as soon as the track can be approximated by one or more fix positions on, or after the valid time of the previous warning;

*receipt of these techniques is virtually assured prior to development of the next warning

*improved (mean) forecast accuracy.

This latter aspect arises because JTWC now has a more reliable approximation of the short-term tropical cyclone movement. Further, since most of the objective techniques are biased for persistence, this new procedure optimizes their performance and provides more consistent guidance on short-term movement, indirectly yielding a more accurate initial position estimate as well as lowering 24-hour forecast errors.

b. Description of Objective Techniques

(1) CLIM -- A climatological aid providing 24-, 48- and 72-hour tropical cyclone forecast positions (and intensity changes in the western North Pacific) based upon the position of the tropical cyclone. The output is based upon data records from 1945 to 1981 for the western North Pacific Ocean and 1900 to 1981 for the North Indian Ocean.

(2) TYAN78 -- An updated analog program which combines the earlier versions TYFN 75 and INJAH 74. The program scans history tapes for tropical cyclones similar (within a specified acceptance envelope) to the current tropical cyclone. For the western North Pacific Ocean, three forecasts of position and intensity are provided for 24-, 48- and 72-hours: RECR - a weighted mean of all accepted tropical cyclones which were categorized as "recurving" during their best track period; STRA - a weighted mean of all accepted tropical cyclones which were categorized as moving "straight" (westward) during their best track period; and TOTL - a weighted mean of all accepted tropical cyclones, including those used in the RECR and STRA forecasts. For the North Indian Ocean, a single (total) forecast track is provided for 12-hour intervals to 72 hours.

(3) BPAC -- A program which generates 12- to 72-hour forecast positions based on blending the past motion of the tropical cyclone with the CLIM forecast positions. The blending routine gives less weight to persistence at each succeeding forecast interval.

(4) XTRP -- Forecast positions for 24- and 48-hours are derived from the extension of a straight line which connects the most-recent and 12-hour-old preliminary best track positions.

(5) HPAC -- 24- and 48-hour forecast positions are derived by merely connecting the mid-points of straight lines which connect these positions on the XTRP and CLIM tracks, respectively.

(6) CYCLOPS -- An updated version of the HATTRACK/MOHATT steering program which can provide geostrophic steering forecasts at the 1000-, 850-, 700-, 500-, 400-, and 200-mb levels. The program can be run in a modified (includes a 12-hour persistence bias) or unmodified mode applied to either analysis or prognostic fields. The program advects a point vortex on a preselected analysis and/or smoothed prognostic field at designated levels in six-hour time steps through 72 hours. In 1982, only the modified version, in the prognostic mode for the 500-mb level was verified; however, JTWC routinely uses many of the other levels and modes as operational forecast aids.

(7) OTCM -- (One-way Tropical Cyclone Model) A coarse-mesh, three-layer in the vertical, primitive equation model with a 205 km grid spacing over a 6400 x 4700 km domain. The model's fields are computed around a bogused, digitized cyclone vortex using FNOC Global Bands prognostic fields for the specified valid time. The past motion of the tropical cyclone is compared to initial steering fields and a bias correction is computed and applied to the model. FNOC hemispheric prognostic fields are used at 12-hour intervals to update the model's boundaries. The resultant forecast positions are derived by locating the 850 mb vortex at six-hour intervals to 72 hours. In 1982, the OTCM was requested for each warning; and when computer resources were available, the OTCM forecast was normally available to the TDO within one hour of the request.

(8) NTCM -- (Nested Tropical Cyclone Model) A primitive equation model with similar properties as the OTCM. The NTCM differs by containing a finer scale "nested" grid, initializing on Global Bands analysis fields, not containing a (persistence) bias correction, and being a channel model which runs independent of FNOC prognostic fields (not requiring updating of its boundaries). The "nested" grid covers a 1200 x 1200 km area with a 41 km grid spacing which moves within the coarse-mesh domain to keep an 850 mb vortex at its center. In 1982, the NTCM was incorporated into the FNOC job-stream and 72-hour forecast tracks were produced automatically from analysis fields, utilizing the 0000Z and 1200Z warning positions. These forecasts were normally received within 12 hours of their valid times and provided guidance for 1200Z and 0000Z warnings, respectively.

(9) TAPT -- A technique which utilizes upper-tropospheric wind fields to estimate the latitude of initial acceleration associated with the tropical cyclone's interaction with the mid-latitude westerly steering currents. Further, the technique provides speed of movement guidelines for duration and upper-limits, and insight on the probable path of the tropical cyclone, given a prevailing upper-wind pattern during the acceleration process.

(10) THETA E -- An empirically derived relationship between a tropical cyclone's minimum sea level pressure (MSLP) and (700 mb) equivalent potential temperature (θ_e) was developed by Sikora (1976) and Dunnavan (1981). By monitoring MSLP and θ_e trends, the forecaster can evaluate the potential for sudden, rapid deepening of a tropical cyclone.

(11) WIND RADIUS -- Following an analytic model of the radial profiles of sea level pressures and winds in mature tropical cyclones (Holland, 1980), a set of radii for 30-, 50-, and 100-knot winds based on the tropical cyclone's maximum intensity and radius of maximum winds have been produced to aid the forecaster in determining forecast wind radii.

(12) DVORAK -- An estimation of a tropical cyclone's current and 24-hour forecast intensity is made from interpretation of visual satellite imagery (Dvorak, 1973) and provided to the forecaster. These intensity estimates are used in conjunction with other intensity-related data and trends to forecast tropical cyclone intensity.

c. Testing and Results

A comparison of selected techniques is included in Table 4-7 for all western North Pacific tropical cyclones and in Table 4-9 for all North Indian Ocean tropical cyclones. In these tables, "X-AXIS" refers to techniques listed vertically. The example in Table 4-7 compares CY50 to OTCM, i.e. in the 435 cases available for a (homogeneous) comparison, the average vector error at 24 hours was 111 nm for CY50 and 119 nm for OTCM. The difference of 8 nm is shown in the lower right. (Differences are not always exact, due to computational round-off which occurs for each of the cases available for comparison).

A comparison of mean and median forecast errors (for a non-homogeneous data set) is provided for selected techniques in Table 4-6 for all western North Pacific tropical cyclones and in Table 4-8 for all North Indian Ocean tropical cyclones.

TABLE 4-6.

COMPARISON OF FORECAST ERRORS (NM) BY TECHNIQUE
IN 1982 FOR THE WESTERN NORTH PACIFIC

	24-HOUR RESULTS*				48-HOUR RESULTS*				72-HOUR RESULTS*			
TECHNIQUE	MEAN	MEDIAN	STD DEV	(CASES)	MEAN	MEDIAN	STD DEV	(CASES)	MEAN	MEDIAN	STD DEV	(CASES)
JTWC	113	98	73	(665)	237	209	158	(535)	341	296	225	(428)
RECR	116	97	77	(588)	237	203	144	(504)	387	344	243	(423)
STRA	121	101	85	(589)	258	205	185	(513)	434	312	271	(434)
TOTL	112	96	72	(612)	230	197	145	(523)	440	321	246	(440)
CY50	112	100	69	(579)	277	236	184	(496)	408	407	315	(408)
NTCM	143	128	85	(181)	238	208	140	(153)	353	347	180	(124)
OTCM	122	108	73	(479)	232	206	134	(405)	330	289	220	(330)
BPAC	123	104	79	(613)	248	207	169	(527)	442	309	285	(442)
CLIM	150	126	100	(648)	272	226	182	(554)	467	323	295	(467)
XTRP	117	101	89	(635)	264	229	168	(542)				
HPAC	112	98	76	(633)	217	183	143	(540)				

* THIS DATA SET REPRESENTS ALL FORECAST ERRORS FOR EACH TECHNIQUE LISTED AGAINST THE CORRESPONDING BEST TRACK POSITIONS AT 24, 48, AND 72 HOURS.

TABLE 4-7. 1982 ERROR STATISTICS FOR SELECTED OBJECTIVE TECHNIQUES IN THE WESTERN NORTH PACIFIC OCEAN

24-HOUR FORECAST ERRORS (NM)

24-	JTWC		RECR		STRA		TOTL		CY50		NTCM		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	665	113																				
	113	0																				
RECR	583	113	588	116																		
	115	2	116	0																		
STRA	584	110	561	114	589	121																
	121	11	120	7	121	0																
TOTL	607	112	583	116	583	121	612	112														
	112	0	110	-5	110	-10	112	0														
CY50	575	112	534	114	532	119	554	111	579	112												
	112	0	110	-2	107	-11	110	0	112	0												
NTCM	179	102	163	111	159	120	167	108	159	113	181	143										
	143	40	141	30	137	17	141	33	142	29	143	0										
OTCM	477	113	441	119	436	122	455	113	435	111	138	137	479	122								
	122	9	123	4	118	-2	122	9	119	8	120	-15	122	0								
BPAC	610	111	556	114	559	119	580	110	548	110	170	140	458	120	613	123						
	122	11	121	8	120	1	121	12	119	9	119	-20	121	1	123	0						
CLIM	643	112	585	116	587	121	609	112	574	111	176	142	476	122	611	122	648	150				
	150	38	148	32	146	25	150	38	149	38	148	7	150	28	147	24	150	0				
XTRP	630	112	575	116	575	121	599	112	566	111	171	142	469	121	600	121	633	150	635	117		
	117	5	114	-1	110	-10	113	1	115	5	113	-29	119	-1	116	-4	117	-32	117	0		
HPAC	628	111	573	116	575	121	597	112	564	110	171	142	468	121	600	121	633	150	633	117	633	112
	111	0	109	-5	107	-14	110	-1	110	0	105	-33	113	-8	109	-11	112	-37	112	-4	112	0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y - X

48-HOUR FORECAST ERRORS (NM)

48-	JTWC		RECR		STRA		TOTL		CY50		NTCM		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	535	237																				
	237	0																				
RECR	476	233	504	237																		
	233	0	237	0																		
STRA	486	231	489	234	513	258																
	258	26	256	22	258	0																
TOTL	493	234	498	238	508	257	523	230														
	228	-5	227	-10	228	-28	230	0														
CY50	466	235	458	239	468	261	475	231	496	277												
	267	32	277	39	272	12	277	46	277	0												
NTCM	145	221	139	231	139	258	141	224	139	291	153	238										
	238	16	237	6	237	-20	243	19	244	-47	238	0										
OTCM	384	237	373	248	380	264	384	233	371	270	122	238	405	232								
	229	-7	232	-14	231	-32	233	0	228	-41	236	-1	232	0								
BPAC	498	232	479	233	493	258	499	226	473	275	146	239	386	229	527	248						
	240	8	249	17	247	-9	249	23	251	-23	245	6	250	21	248	0						
CLIM	521	234	501	237	512	258	520	230	492	275	151	238	402	233	526	248	554	272				
	267	32	271	34	270	12	275	45	273	-1	273	36	277	45	266	18	272	0				
XTRP	509	234	491	237	501	258	510	230	485	275	147	237	397	232	517	248	540	270	542	264		
	262	28	260	23	255	-2	258	28	262	-12	262	24	266	34	264	16	263	-6	264	0		
HPAC	507	233	489	237	501	258	508	230	483	273	147	237	396	232	517	248	540	270	540	263	540	217
	212	-20	214	-21	213	-45	216	-13	218	-53	220	-16	223	-8	215	-32	217	-52	217	-45	217	0

JTWC - OFFICIAL JTWC FORECAST
RECR - RECURVER (TYAN 78)
STRA - STRAIGHT (TYAN 78)
TOTL - TOTAL (TYAN 78)
CY50 - CYCLOPS MODIFIED 500 MB PROG
NTCM - NESTED TROPICAL CYCLONE MODEL
OTCM - ONE-WAY TROPICAL CYCLONE MODEL
BPAC - BLENDED PERSISTENCE AND CLIM
CLIM - CLIMATOLOGY
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIM

72-HOUR FORECAST ERRORS (NM)

72-	JTWC		RECR		STRA		TOTL		CY50		NTCM		OTCM		BPAC		NTCM	
JTWC	428	341																
	341	0																
RECR	378	328	423	387														
	365	37	387	0														
STRA	393	333	413	383	434	390												
	386	53	385	2	390	0												
TOTL	396	336	419	387	430	388	440	373										
	360	25	364	-22	368	-19	373	0										
CY50	366	345	375	384	387	393	390	377	408	463								
	433	88	465	82	463	70	466	89	463	0								
NTCM	113	326	116	387	116	418	116	378	111	487	124	353						
	356	30	355	-30	356	-61	360	-17	358	-128	353	0						
OTCM	299	326	303	390	310	391	312	364	293	440	98	338	330	346				
	332	7	342	-47	341	-49	348	-16	340	-99	356	19	346	0				
BPAC	402	336	399	379	414	390	417	369	388	465	119	359	313	341	442	388		
	364	28	384	4	384	-4	389	20	389	-75	375	17	375	34	388	0		
CLIM	420	340	420	387	432	389	437	373	405	464	123	355	327	346	442	388	467	409
	390	50	399	12	406	17	415	42	405	-58	399	45	410	64	402	14	409	0

TABLE 4-8.

COMPARISON OF FORECAST ERRORS (NM) BY TECHNIQUE
IN 1982 FOR THE NORTH INDIAN OCEAN

	24-HOUR RESULTS*				48-HOUR RESULTS*				72-HOUR RESULTS*			
TECHNIQUE	MEAN	MEDIAN	STD DEV	(CASES)	MEAN	MEDIAN	STD DEV	(CASES)	MEAN	MEDIAN	STD DEV	(CASES)
JTWC	138	115	93	(37)	368	277	189	(18)	762	887	277	(7)
TOTL	132	120	82	(20)	375	307	181	(7)	883	870	13	(2)
NTCM	319	338	69	(7)	556	578	161	(5)	918	923	80	(3)
CY85	159	142	82	(27)	289	248	136	(13)	426	405	212	(5)
CY50	192	166	129	(27)	433	628	283	(13)	940	1119	420	(5)
OTCM	235	235	66	(13)	522	522	77	(7)	765	798	224	(4)
BPAC	134	133	73	(29)	340	336	127	(12)	853	666	283	(4)
CLIM	218	242	78	(29)	483	523	123	(13)	818	838	51	(4)
XTRP	128	104	75	(28)	326	297	150	(14)				
HPAC	159	167	65	(27)	385	403	112	(13)				

* THIS DATA SET REPRESENTS ALL FORECAST ERRORS FOR EACH TECHNIQUE LISTED AGAINST THE CORRESPONDING BEST TRACK POSITIONS AT 24, 48, AND 72 HOURS.

TABLE 4-9. 1982 ERROR STATISTICS FOR SELECTED OBJECTIVE TECHNIQUES IN THE NORTH INDIAN OCEAN

24-HOUR FORECAST ERRORS (NM)

24-	JTWC		TOTL		NTCM		CY85		CY50		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	37	138																		
	138	0																		
TOTL	20	133	20	132																
	132	0	132	0																
NTCM	7	201	4	166	7	319														
	319	118	268	102	319	0														
CY85	27	153	20	132	6	301	27	159												
	159	7	164	31	170	-130	159	0												
CY50	27	153	20	132	6	301	27	159	27	192										
	192	40	179	47	219	-81	192	33	192	0										
OTCM	13	172	9	128	3	329	13	140	13	208	13	235								
	235	63	223	95	280	-47	235	95	235	27	235	0								
BPAC	29	137	19	121	5	293	26	165	26	186	13	235	29	134						
	134	-2	129	8	170	-123	134	-30	134	-51	153	-81	134	0						
CLIM	29	137	19	121	5	293	26	165	26	186	13	235	29	134	29	218				
	218	81	198	77	210	-82	217	53	217	31	235	0	218	84	218	0				
XTRP	28	149	19	134	5	310	25	150	25	194	12	237	27	136	27	219	28	128		
	128	-20	126	-7	195	-114	130	-19	130	-63	135	-101	120	-15	120	-98	128	0		
HPAC	27	141	18	122	4	304	24	155	24	187	12	237	27	136	27	219	27	120	27	159
	159	18	155	33	185	-117	165	10	165	-21	183	-53	159	23	159	-59	159	39	159	0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y - X

48-HOUR FORECAST ERRORS (NM)

48-	JTWC		TOTL		NTCM		CY85		CY50		OTCM		BPAC		CLIM		XTRP		HPAC	
JTWC	18	368																		
	368	0																		
TOTL	7	371	7	375																
	375	4	375	0																
NTCM	5	444	2	404	5	556														
	556	112	423	18	556	0														
CY85	13	397	7	375	4	564	13	289												
	289	-107	290	-84	261	-302	289	0												
CY50	13	397	7	375	4	564	13	289	13	433										
	433	36	465	90	568	4	433	144	433	0										
OTCM	7	473	3	449	2	705	7	238	7	528	7	522								
	522	49	557	108	566	-138	522	284	522	-5	522	0								
BPAC	12	356	6	331	2	494	11	300	11	386	6	504	12	340						
	340	-15	354	23	260	-233	326	26	326	-59	417	-86	340	0						
CLIM	13	370	6	331	3	559	12	298	12	406	7	522	12	340	13	483				
	483	113	432	101	436	-122	480	181	480	73	549	27	475	135	483	0				
XTRP	14	392	7	375	4	564	13	289	13	433	7	522	12	340	13	483	14	326		
	326	-64	355	-19	419	-144	324	36	324	-107	386	-136	295	-43	307	-175	326	0		
HPAC	13	370	6	331	3	559	12	298	12	406	7	522	12	340	13	483	13	307	13	385
	385	15	370	38	381	-177	381	82	381	-25	452	-70	375	36	385	-97	385	78	385	0

JTWC - OFFICIAL JTWC FORECAST
TOTL - ANALOG (TYAN 78)
NTCM - NESTED TROPICAL CYCLONE MODEL
CY85 - CYCLOPS MODIFIED 850 MB PROG
CY50 - CYCLOPS MODIFIED 500 MB PROG
OTCM - ONE-WAY TROPICAL CYCLONE MODEL
BPAC - BLENDED PERSISTENCE AND CLIM
CLIM - CLIMATOLOGY
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIM

72-HOUR FORECAST ERRORS (NM)

72-	JTWC		TOTL		NTCM		CY85		CY50		OTCM		BPAC		CLIM	
JTWC	7	762														
	762	0														
TOTL	2	983	2	883												
	883	-99	883	0												
NTCM	3	943	1	870	3	918										
	918	-23	923	53	918	0										
CY85	5	801	2	883	3	918	5	426								
	426	-374	333	-549	366	-552	426	0								
CY50	5	801	2	883	3	918	5	426	5	940						
	940	139	1218	335	1105	187	940	515	940	0						
OTCM	4	746	1	896	2	916	4	467	4	884	4	765				
	765	20	899	3	885	-30	765	298	765	-118	765	0				
BPAC	4	746	1	896	2	916	4	467	4	884	4	765	4	853		
	853	107	935	39	906	-9	853	386	853	-30	853	88	853	0		
CLIM	4	746	1	896	2	916	4	467	4	884	4	765	4	853	4	818
	818	72	838	-57	793	-122	818	351	818	-65	818	53	818	-34	818	0

CHAPTER V - APPLIED TROPICAL CYCLONE RESEARCH SUMMARY

1. JTWC RESEARCH

With the addition of the Southern Hemisphere to the JTWC area of responsibility, JTWC's applied research has been substantially reduced. The goal of JTWC's effort in the research area has been to improve the timeliness and accuracy of operational tropical cyclone warnings. During 1982, JTWC continued to pursue projects of merit as summarized below:

WEIGHTED STEERING PROGRAM

(Allen, R.L: NAVOCEANCOMCEN/JTWC)

A forecast position aid is currently under development which applies an empirically-derived bias to CYCLOPS unmodified steering prognostics. Preliminary results indicate that the 700 mb steering flow (with bias) is the best predictor of meridional motion and a biased average of 850 and 500 mb flow is the best predictor of zonal motion. Initial results from verification studies are promising; further investigation will be conducted during the 1983 tropical cyclone season.

JTWC FORECASTER'S HANDBOOK

(Wells, F.H.; Edson, R.E.; Weir, R.C.: NAVOCEANCOMCEN/JTWC)

An ambitious project to accumulate, in one compendium, the practical information necessary for an operational tropical cyclone forecaster in the western Pacific and Indian Ocean regions.

COMBINED TROPICAL CYCLONE FORECASTING AIDS

(Edson, R.E., et al: NAVOCEANCOMCEN/JTWC)

The project objective was to receive all FNOC tropical cyclone forecasting aids as the result of a single request. Several decoder problems were tested and corrected. Additionally, procedures were developed to automate execution of the Nested Tropical Cyclone Model when a tropical cyclone was in warning status.

CLIMATOLOGY (CLIM) FORECAST AID UPDATE

(Edson, R.E., et al: NAVOCEANCOMCEN/JTWC)

The CLIM data base was updated through the 1981 tropical cyclone season. In the western North Pacific, five years of new data increased the data base by 16 percent. In the other JTWC regions, the data base was increased by 30 percent with the addition of 10 years of tropical cyclone best track data.

TYAN OBJECTIVE FORECAST AID UPDATE

(Edson, R.E., et al: NAVOCEANCOMCEN/JTWC)

The TYAN data base for the Southern Hemisphere and the North Indian Ocean was updated through the 1981 tropical cyclone season, yielding a 30 percent increase in tropical cyclone positions. Procedures were developed to implement the annual update more efficiently. It was also recommended that the western North Pacific model classification of tropical cyclone tracks (RECR, STRA and TOTL) be modified to increase the model's resolution.

CYCLOPS OBJECTIVE FORECAST AID UPDATE

(Edson, R.E.: NAVOCEANCOMCEN/JTWC)

In light of the recent development of dynamic tropical cyclone models, CYCLOPS could best serve the forecaster as a "plain" steering aid. This would require:

a) Removal of the, sometime aberrant, persistance correction.

b) Changing of the long wave filter to more accurately depict wave numbers.

c) Testing the size/strength of the tropical cyclone for significance.

After testing for effectiveness with the NOGAPS global model, the updated CYCLOPS would be used in conjunction with the dynamic models to indicate expected steering flow at specific levels.

NAVY OPERATIONAL GLOBAL ATMOSPHERIC PREDICTION SYSTEM (NOGAPS) EVALUATION

(Edson, R.E.: NAVOCEANCOMCEN/JTWC)

JTWC participated in evaluating the tropics portion of FNOC Monterey's new global model.

2. NEPRF RESEARCH

TROPICAL CYCLONE STORM SURGE

(Brand, S., NAVENVPREDRSCHFAC; Jarrell, J.D., Compton, J., Science Applications Inc.)

A tropical cyclone storm surge evaluation has been initiated to establish the following: (a) the needs of the Navy in forecasting tropical cyclone storm surge in the western Pacific; (b) the state of the art of storm surge forecasting techniques; and (c) the best approach to solving the Navy's problems associated with tropical cyclone storm surge.

THE NAVY TWO-WAY INTERACTIVE NESTED TROPICAL CYCLONE MODEL (NTCM)

(Fiorino, M., NAVENVPREDRSCHFAC)

Testing of the NTCM concept continued throughout the 1982 season on two versions of the model - the current Cyber 175 version automatically run using the tropical NVA (global bands) analysis, and an improved model coded for the Cyber 205, (NTCM205) the results of which were clearly superior. The NTCM205 performance was markedly reduced when initialized with NOGAPS analyses compared to the NVA analyses. This discrepancy was attributed to a combination of NOGAPS initialization and data assimilation procedures and the high degree of NTCM sensitivity to the large-scale initial wind fields.

Testing will continue on the one-way influence lateral boundary conditions developed at the National Meteorological Center (NMC) which are designed to force outside-the-domain information into forecasts of a limited area model. Experiments will be conducted on expanding the domain of the NTCM Coarse Grid (the large-scale tropical model) to minimize the influence of the channel boundary conditions.

TROPICAL CYCLONE OPTIMUM FORECAST AID

(Tsui, T., NAVENVPREDRSCHFAC)

A comprehensive review of the performance of all JTWC objective tropical cyclone forecast aids has shown that during 19'9-1981 --- if JTWC could have selected the "correct" or the "optimum" forecast aid every time --- the average forecast error could be reduced to 71, 119 159 nm (132, 220, 295 km) for the 24-, 48-, and 72-hour forecasts respectively. The question remains as to which technique is the optimum aid for each situation.

A full-scale test of the optimum-aid concept is now underway. The logical first step of this study is to assess the strength and the characteristics of each objective forecast aid.

TROPICAL CYCLONE OBJECTIVE FORECAST CONFIDENCE AND DISPLAY TECHNIQUE

(Tsui, T., NAVENVPREDRSCHFAC; Nuttal, K., Systems and Applied Sciences Corp.)

In July 1982, forecasters at JTWC could operationally issue a single ARQ command to activate all 11 objective tropical cyclone forecast aids for North Pacific tropical cyclones.

When the system is completed in 1983, a weighted combined tropical cyclone forecast composed from all available objective aids will be issued upon each combined ARQ request. The weights of the combination are deduced from the past (1979-1981) performance of the aids.

SPEED OF RECURVING TYPHOONS

(Sadler, J.C. and B. Cheng-Lan University of Hawaii)

Western North Pacific tropical cyclone data were evaluated to determine the characteristics of recurving typhoons, near and after the time of recurvature, during the 10-year period 1970-1979. Three recurving typhoons which produced large forecast errors after recurvature were selected for case studies in search of aids for anticipating the acceleration in speed of movement after recurvature. Analyses of the upper-troposphere poleward of the typhoons revealed a good relation between the future storm speed and the averaged wind speed between 500 and 200 mb, observed, at and 12 hours prior to recurvature, along the future storm track.

SATELLITE BASED TROPICAL CYCLONE INTENSITY FORECASTS

(Cook, J. and Tsui, T., NAVENVPREDRSHFAC; F. Nicholson, Systems Control Technology)

Software development is currently underway, for implementation on the NAVENVPREDRSCHFAC Satellite-data Processing and Display System (SPADS), to enable study of cloud structures in the newly developed spherical - spiral coordinate system. A Fourier analysis is performed on the cloud structure in spiral space with various harmonics correlated with atmospheric parameters.

Also under investigation is a method of studying the relationship between cyclone intensity and IR radiances/patterns in Lagrangian coordinates. Satellite images of tropical cyclones are rotated and the image parameters are correlated with the cyclone intensity and rate of intensity change.

TROPICAL CYCLONE INTENSITY FORECAST

(Tsui, T. and Cook, J., NAVENVPREDRSCHFAC; Hamilton, H., System and Applied Sciences Corporation)

A study of the western North Pacific tropical cyclone intensity forecast program (MAXWND) showed that two synoptic parameters -- the central equivalent potential temperature and the large-scale vertical wind shears -- correlate highly with the intensity change. Efforts have been initiated to quantify the relationships between: (1) the equivalent potential temperature and the central sea surface pressure when below 999 mb; and (2) the NOGAPS large-scale vertical wind shear and the tropical cyclone intensity change.

TROPICAL CYCLONE GUST AND SUSTAINED WIND FORECAST AIDS FOR YOKOSUKA AND CUBI POINT

(Jarrell, J.D. and Englebretson, R.E., Science Applications Inc.)

Forecast aids were developed for predicting wind conditions at Yokosuka and Cubi Point when a tropical cyclone passed within 360 nm (667 km). The forecast aids were produced by analyzing a data set comprising the ratios of station wind values to tropical cyclone center wind values. Ratio values were then assigned to the position of the cyclone center. The 360 nm (667 km) radius circle about the station was divided into 71 equal area segments and the values of the mean and maximum ratio within each segment were subjectively analyzed to produce the forecast aids.

TROPICAL CYCLONE STRIKE AND WIND PROBABILITIES

(Brand, S., NAVENVPREDRSCHFAC; Jarrell, J.D., Science Applications Inc.; Chin, D., Systems and Applied Sciences Corp.)

Tropical cyclone strike and wind probability is a method for determining up through 72 hours that a tropical cyclone will affect geographical points of interest to the user. Applications presently being developed, tested and implemented for the western North Pacific, North Indian Ocean, western North Atlantic, and Gulf of Mexico include: strike/wind probabilities and geographical depictions; optimum track ship routing (OTSR) aids; HP-9845/Tactical Environmental Support System (TESS) software for shipboard environmentalists and decison makers; terrain adjusted probabilities; and condition setting aids.

3. PUBLICATIONS

Diercks, J.W., R.C. Weir and M.K. Kopper, 1982: **Forecast Verification and Reconnaissance Data for Southern Hemisphere Tropical Cyclones.** NAVOCEANCOMCEN/JTWC TECH NOTE: NOCC/JTWC 82-1.

The Joint Typhoon Warning Center (JTWC) area of responsibility now includes the Southern Hemisphere, from 180° longitude westward to the east coast of Africa. This technical note documents forecast verification and reconnaissance data for those Southern Hemisphere tropical cyclones that occurred between 1 July 1980 and 30 June 1982.

Weir, R.C., 1982: Predicting the Acceleration of Northward-moving Tropical Cyclones Using Upper-Tropospheric Winds. NAVOCEANCOMCEN/JTWC TECH NOTE: NOCC/JTWC 82-2.

Inconsistent forecasting of the acceleration of northward-moving tropical cyclones entering the domain of the mid-latitude westerlies has been a long-standing weakness in tropical cyclone forecasting. The tracks of tropical cyclones traversing a relative high-density data area of the western North Pacific have been analyzed to verify the acceleration phenomenon, and to correlate the movement with features of the upper-tropospheric wind field. The resultant forecast technique is described and the results obtained with its use during the 1982 tropical cyclone season in the western North Pacific are presented.

ANNEX A TROPICAL CYCLONE DATA

1. WESTERN NORTH PACIFIC CYCLONE DATA

TROPICAL STORM MAMIE
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
031406Z	7.1	153.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031412Z	7.4	151.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031418Z	7.7	150.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031500Z	7.8	149.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031506Z	7.7	148.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031512Z	7.6	147.8	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031518Z	7.5	147.2	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031600Z	7.3	146.4	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031606Z	7.3	145.5	50	7.0	145.4	50.	19.	0.	5.8	141.8	65.	112.	10.	6.0	137.0	65.	154.	10.	8.0	133.6	65.	327.	5.
031612Z	7.3	144.5	50	7.2	144.8	50.	19.	0.	7.2	141.2	65.	80.	10.	8.1	137.5	65.	214.	10.	10.7	134.2	65.	504.	10.
031618Z	7.3	143.4	55	7.6	143.3	50.	19.	-5.	7.9	139.3	65.	42.	10.	10.1	135.6	65.	231.	10.	13.6	132.6	65.	585.	20.
031700Z	7.4	142.4	55	7.3	142.3	55.	8.	0.	8.2	138.2	60.	74.	5.	9.8	134.5	65.	278.	5.	12.0	131.4	65.	552.	25.
031706Z	7.6	141.3	55	7.4	141.2	55.	13.	0.	9.2	136.7	65.	97.	10.	10.3	132.5	70.	289.	10.	11.0	128.7	65.	446.	25.
031712Z	7.8	140.0	55	7.9	140.0	55.	6.	0.	9.9	135.6	60.	143.	5.	11.2	131.6	65.	371.	10.	11.6	127.8	60.	463.	25.
031718Z	7.9	138.6	55	8.8	138.3	55.	57.	0.	11.1	132.8	60.	178.	5.	12.1	128.0	60.	316.	15.	12.7	124.0	50.	332.	15.
031800Z	7.9	137.0	55	7.9	136.7	50.	18.	-5.	9.1	131.2	60.	85.	0.	9.6	126.3	55.	220.	15.	9.1	122.2	45.	202.	5.
031806Z	8.1	135.5	55	8.0	135.3	55.	13.	0.	9.4	130.0	60.	134.	0.	9.6	125.3	50.	229.	10.	8.8	121.3	40.	194.	5.
031812Z	8.2	133.9	55	8.3	134.0	55.	8.	0.	9.4	128.4	60.	154.	5.	9.5	124.5	50.	241.	15.	8.8	120.4	45.	187.	10.
031818Z	8.2	132.2	55	8.6	132.2	55.	24.	0.	9.5	127.3	50.	195.	5.	9.2	123.4	40.	214.	5.	8.7	119.3	45.	186.	10.
031900Z	8.2	130.1	60	8.1	129.9	55.	13.	-5.	7.6	122.7	35.	48.	-5.	8.3	117.1	35.	117.	-5.	11.0	113.1	40.	159.	5.
031906Z	8.2	128.1	60	8.1	127.7	55.	25.	-5.	8.2	120.5	35.	68.	-5.	9.7	116.0	40.	125.	5.	12.3	112.7	45.	169.	10.
031912Z	8.4	126.0	55	8.2	126.7	55.	43.	0.	8.2	122.8	35.	141.	0.	8.5	117.2	40.	79.	5.	9.5	111.6	45.	178.	15.
031918Z	8.4	124.2	45	8.2	124.8	40.	38.	-5.	8.4	119.7	40.	36.	5.	9.0	114.9	45.	115.	10.	9.7	110.8	45.	191.	15.
032000Z	8.4	122.8	40	8.5	122.2	40.	36.	0.	9.3	115.7	45.	184.	5.	10.2	110.1	50.	331.	15.	11.6	106.3	35.	394.	5.
032006Z	8.5	121.6	40	8.6	120.6	40.	60.	0.	9.5	114.7	45.	201.	10.	10.0	110.3	50.	273.	15.	10.4	106.7	45.	352.	15.
032012Z	8.8	120.5	35	8.5	119.9	40.	40.	5.	9.4	115.2	45.	132.	10.	10.4	110.4	45.	227.	15.	12.9	107.2	25.	202.	-5.
032018Z	9.0	119.8	35	8.5	118.8	35.	66.	0.	10.1	114.7	25.	106.	-10.	11.5	111.0	25.	107.	-5.	13.2	110.2	20.	88.	-10.
032100Z	9.3	118.8	40	9.2	118.0	35.	48.	-5.	10.6	114.2	30.	90.	-5.	11.8	111.4	25.	95.	-5.	13.7	109.6	20.	116.	-5.
032106Z	9.5	118.1	35	9.5	118.3	35.	12.	0.	10.8	115.2	30.	25.	-5.	11.8	112.7	25.	12.	-5.	13.2	110.8	20.	73.	-5.
032112Z	9.8	117.4	35	10.0	117.0	30.	27.	-5.	11.5	113.9	25.	35.	-5.	12.0	111.4	25.	61.	-5.	14.4	109.5	20.	134.	-5.
032118Z	10.1	116.5	35	10.2	116.2	30.	19.	-5.	11.7	112.7	25.	50.	-5.	13.5	110.4	25.	96.	-5.	16.1	109.0	20.	238.	0.
032200Z	10.3	115.7	35	10.7	115.2	30.	38.	-5.	12.5	112.0	25.	80.	-5.	14.2	110.2	20.	129.	-5.	0.0	0.0	0.	-0.	0.
032206Z	10.5	114.9	35	10.5	114.8	30.	6.	-5.	12.2	112.2	25.	30.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032212Z	11.0	114.2	30	11.1	113.6	30.	36.	0.	13.7	110.2	25.	147.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032218Z	11.3	113.6	30	11.3	113.2	25.	24.	-5.	12.9	110.9	25.	51.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032300Z	11.6	113.0	30	11.7	113.2	25.	13.	-5.	13.0	111.0	20.	84.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032306Z	11.8	112.5	30	11.7	112.1	30.	24.	0.	12.5	109.3	25.	50.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032312Z	11.9	111.9	30	11.2	111.5	30.	48.	0.	11.3	109.2	20.	54.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032318Z	12.1	111.2	30	12.0	111.3	30.	8.	0.	12.5	108.8	25.	34.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032400Z	12.1	110.7	25	12.2	110.8	30.	8.	5.	12.4	108.2	15.	30.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032406Z	12.2	110.1	25	12.1	110.0	25.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032412Z	12.2	109.1	25	12.1	109.0	25.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032418Z	12.2	108.3	20	12.1	108.2	20.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032500Z	12.1	107.8	10	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	b.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	25.	93.	188.	276.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	14.	48.	86.	115.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	5.	9.	11.	0.	0.	0.	0.
AVG INTENSITY BIAS	-1.	1.	6.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	35	32	24	23	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2733. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TROPICAL STORM MAMIE
FIX POSITIONS FOR CYCLONE NO. 1

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
*	1	140600	6.9N 154.5E	PCN 5	T0.5/0.5	INIT OBS	PGTW
	2	150000	7.8N 148.7E	PCN 5	T0.5/0.5 /S0.0/18HRS		PGTW
	3	150300	8.1N 148.4E	PCN 5			PGTW
	4	151721	8.1N 147.0E	PCN 5			PGTW
	5	160000	7.0N 146.1E	PCN 5	T1.0/1.0 /D0.5/24HRS	ULCC FIX	PGTW

6	160300	7.4N 145.9E	PCN 5			PGTW
7	160424	7.3N 145.7E	PCN 5			PGTW
8	160600	7.3N 145.6E	PCN 5			PGTW
9	160900	7.4N 145.1E	PCN 5			PGTW
10	161200	7.0N 144.3E	PCN 5			PGTW
11	161600	7.7N 143.7E	PCN 5			PGTW
12	161709	7.7N 143.6E	PCN 5			PGTW
13	162100	7.1N 142.4E	PCN 5			PGTW
14	170000	7.5N 142.2E	PCN 5	T3.0/3.0 /D2.0/24HRS		PGTW
15	170300	7.4N 141.4E	PCN 5			PGTW
16	170554	7.4N 140.9E	PCN 5			PGTW
17	170900	8.5N 140.7E	PCN 5		ULCC FIX	PGTW
18	171200	8.2N 139.5E	PCN 5			PGTW
* 19	171600	9.2N 138.1E	PCN 5			PGTW
20	180000	7.8N 136.7E	PCN 3	T3.5/3.5 /D0.5/24HRS		PGTW
21	180300	7.9N 136.3E	PCN 5			PGTW
22	180542	8.1N 135.3E	PCN 5			PGTW
23	181800	8.2N 131.8E	PCN 5			PGTW
24	190000	8.2N 130.0E	PCN 5			PGTW
25	190300	8.1N 128.7E	PCN 5	T4.0/4.0-/D0.5/27HRS		PGTW
26	190530	8.3N 127.8E	PCN 6			PGTW
27	190900	8.2N 127.3E	PCN 5			PGTW
28	191600	8.6N 124.6E	PCN 5		ULCC FIX	PGTW
29	191815	8.7N 124.2E	PCN 5			PGTW
30	192100	8.5N 122.8E	PCN 5			PGTW
31	200000	8.7N 122.0E	PCN 5			PGTW
32	200300	8.3N 121.6E	PCN 5	T2.5/3.0+/W1.5/24HRS		PGTW
33	200600	8.4N 121.1E	PCN 5			PGTW
34	200900	8.7N 120.6E	PCN 5			PGTW
35	201200	9.0N 120.4E	PCN 5		ULCC FIX	PGTW
36	201600	9.4N 119.6E	PCN 5			PGTW
* 37	201800	9.9N 119.1E	PCN 5			PGTW
* 38	202100	10.2N 118.7E	PCN 5			PGTW
39	210000	9.2N 119.0E	PCN 3			PGTW
40	210300	9.3N 118.6E	PCN 5	T3.0/3.0 /D0.5/24HRS		PGTW
41	210600	9.6N 118.0E	PCN 5			PGTW
42	210640	10.0N 117.8E	PCN 5	T2.0/2.0	INIT OBS	RPMK
43	210900	11.4N 115.6E	PCN 5		ULCC FIX EXP LLCC NOT APPARENT	PGTW
44	211200	9.8N 116.7E	PCN 5		BASED ON CONTINUITY	PGTW
45	211600	10.1N 116.3E	PCN 5		EXP LLCC	PGTW
46	212100	10.3N 116.2E	PCN 5		EXP LLCC BASED ON CONTINUITY	PGTW
47	220000	10.2N 115.9E	PCN 3			PGTW
48	220300	10.4N 115.2E	PCN 3	T2.0/3.0 /W1.0/24HRS		PGTW
49	220600	11.2N 114.4E	PCN 5			PGTW
50	220636	11.2N 114.6E	PCN 5	T2.0/2.0-/S0.0/24HRS		RPMK
51	220900	11.2N 113.8E	PCN 5			PGTW
52	221200	11.2N 113.9E	PCN 5			PGTW
53	221600	11.4N 113.7E	PCN 5			PGTW
54	221921	11.2N 114.0E	PCN 5		EXP LLCC	RPMK
55	222100	11.4N 113.7E	PCN 5		EXP LLCC	PGTW
56	230000	11.4N 112.9E	PCN 5			PGTW
57	230300	11.4N 112.5E	PCN 5	T2.0/2.0 /S0.0/24HRS		PGTW
58	230625	11.3N 112.0E	PCN 5			PGTW
59	230900	11.3N 111.9E	PCN 5			PGTW
60	231200	12.1N 111.9E	PCN 5		BRKS CONTINUITY	PGTW
61	231909	12.1N 111.3E	PCN 3		EXP LLCC	RPMK
62	231910	12.0N 111.2E	PCN 5			RODN
63	232100	12.1N 111.0E	PCN 5			PGTW
64	240300	11.0N 110.4E	PCN 5	T1.5/2.0-/W0.5/24HRS	BASED ON EXTRAP	PGTW
65	240600	12.1N 109.6E	PCN 5			PGTW
66	240900	12.1N 109.2E	PCN 5			PGTW
67	241200	12.1N 108.6E	PCN 5			PGTW
68	241600	11.8N 108.0E	PCN 5			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	160359	7.2N 145.0E	1500FT		990	50 200 10	270 55 200 10	10 4	CIRCULAR	20	+24 +25 +25 27	1
2	161921	7.2N 143.1E	700MB	3034			120 45 050 40	10 5	ELLIPTICAL	15 10 030	+12 +16 +10	2
3	162131	7.2N 142.0E	700MB	3034	994	45 300 10	120 55 360 10	10 3	ELLIPTICAL	15 10 040	+12 +15 +10	2
4	172217	7.9N 137.2E	700MB	3062	994	50 340 10	050 36 310 60	3 10			+12 +16 + 8	4
5	180633	8.1N 135.3E	700MB	3086		45 350 70	080 53 320 60	8 2				5
6	180847	8.2N 134.3E	700MB	3066		65 330 10	120 48 350 8	9 1			+11 +17 + 7	5
7	182215	8.1N 130.4E	700MB	3007	991	55 040 8	120 54 040 20	7 4	ELLIPTICAL	10 08 090	+12 +14	6

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	191800	8.5N 124.3E	LAND				20192 53220		10.3N 124.0E	98646
2	192200	8.5N 123.4E	LAND				25551 52810		10.3N 124.0E	98646
3	200000	8.7N 123.3E	LAND				22531 52910		10.3N 124.0E	98646

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON NELSON
BEST TRACK DATA

	BEST TRACK			WARNING				24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
031806Z	3.8	160.7	25	0.0	0.0	0.	-0. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031812Z	4.5	158.8	25	0.0	0.0	0.	-0. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031818Z	4.9	157.1	30	0.0	0.0	0.	-0. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031900Z	5.5	155.5	40	5.3	155.5	35.	12. -5.	7.6	149.8	50.	42.	0.	8.2	144.8	60.	59.	10.	8.5	139.8	70.	21.	5.
031906Z	5.9	153.9	50	5.9	154.0	50.	6. 0.	8.5	149.0	60.	98.	10.	9.2	143.8	65.	91.	10.	9.0	138.2	75.	38.	15.
031912Z	6.4	152.4	55	6.3	152.2	55.	13. 0.	8.4	146.6	60.	103.	10.	8.9	141.8	70.	89.	10.	8.6	136.1	75.	12.	15.
031918Z	6.7	151.0	55	7.0	150.4	55.	40. 0.	8.7	144.8	60.	131.	10.	8.8	140.0	70.	88.	5.	8.5	134.4	75.	38.	15.
032000Z	6.9	149.9	50	7.0	149.5	50.	25. 0.	8.6	143.9	55.	116.	5.	9.2	139.2	60.	57.	-5.	8.3	133.6	65.	48.	0.
032006Z	6.9	148.7	50	7.3	148.5	50.	27. 0.	8.5	144.2	50.	44.	-5.	9.2	140.0	55.	141.	-5.	9.6	135.0	60.	156.	-10.
032012Z	7.0	147.6	50	7.0	147.6	50.	0. 0.	8.0	143.1	55.	13.	-5.	8.7	138.8	50.	160.	-10.	8.7	133.7	50.	141.	-20.
032018Z	7.3	146.5	50	7.2	146.2	50.	19. 0.	8.3	140.6	55.	43.	-10.	8.8	135.3	50.	32.	-10.	8.5	130.5	45.	60.	-25.
032100Z	7.5	145.5	50	7.6	146.4	50.	54. 0.	8.5	141.2	60.	102.	-5.	8.9	136.1	60.	155.	-5.	8.5	130.2	55.	83.	-20.
032106Z	7.8	144.4	55	7.9	144.3	55.	8. 0.	8.8	139.8	65.	125.	5.	9.0	134.8	60.	143.	-10.	8.7	129.0	60.	67.	-20.
032112Z	7.9	142.9	60	7.9	143.4	55.	30. -5.	9.0	139.0	60.	172.	0.	9.3	134.0	60.	154.	-10.	9.2	128.3	55.	36.	-30.
032118Z	8.1	141.3	65	8.0	142.0	60.	42. -5.	9.1	137.0	70.	130.	10.	9.8	131.4	65.	62.	-5.	10.4	126.2	55.	94.	-35.
032200Z	8.3	139.5	65	8.2	139.9	65.	24. 0.	9.2	134.1	75.	36.	10.	10.8	128.6	70.	85.	-5.	11.7	123.8	55.	222.	-40.
032206Z	8.6	137.7	60	8.5	138.1	65.	24. 5.	10.0	132.0	75.	54.	5.	11.6	126.0	70.	197.	-10.	11.8	122.2	55.	285.	-45.
032212Z	8.8	136.1	60	8.8	136.2	65.	6. 5.	10.8	130.6	75.	102.	5.	11.6	125.8	65.	178.	-20.	11.6	121.8	50.	267.	-55.
032218Z	9.0	134.8	60	9.1	134.2	65.	36. 5.	10.8	128.7	65.	127.	-5.	11.6	124.2	55.	230.	-35.	11.5	120.0	45.	331.	-55.
032300Z	9.1	133.5	65	9.2	133.5	80.	6. 15.	10.3	129.3	90.	38.	15.	10.9	125.2	65.	127.	-30.	10.9	121.1	50.	221.	-45.
032306Z	9.2	132.4	70	9.3	132.2	80.	13. 10.	10.3	127.3	90.	94.	10.	10.8	123.3	50.	209.	-50.	11.2	119.4	50.	274.	-35.
032312Z	9.3	131.4	70	9.4	131.1	80.	19. 10.	10.0	125.9	75.	136.	-10.	10.2	121.5	50.	278.	-55.	11.2	117.4	55.	359.	-25.
032318Z	9.5	130.4	70	9.5	129.9	75.	30. 5.	10.0	125.1	65.	154.	-25.	10.7	120.8	50.	278.	-50.	11.9	116.8	55.	359.	-20.
032400Z	9.7	129.5	75	9.5	129.5	70.	12. -5.	9.9	126.2	65.	60.	-30.	10.3	123.5	45.	77.	-50.	11.5	119.2	50.	177.	-15.
032406Z	9.8	128.8	80	9.6	128.8	75.	12. -5.	9.9	125.8	70.	64.	-30.	10.1	123.0	50.	64.	-35.	11.2	119.2	50.	129.	-10.
032412Z	9.8	128.2	85	9.6	128.2	90.	12. 5.	9.6	125.4	85.	72.	-20.	9.7	122.7	60.	91.	-20.	10.5	118.9	65.	122.	10.
032418Z	9.9	127.7	90	9.7	127.4	100.	21. 10.	9.7	124.6	75.	68.	-25.	9.9	121.8	60.	116.	-15.	10.9	118.1	65.	106.	20.
032500Z	10.1	127.2	95	9.8	127.0	100.	22. 5.	10.2	124.5	70.	19.	-25.	10.5	122.2	60.	72.	-5.	11.9	119.0	65.	42.	25.
032506Z	10.3	126.8	100	10.2	126.9	100.	8. 0.	11.0	125.6	90.	99.	5.	11.7	123.2	60.	112.	0.	12.3	121.0	55.	191.	10.
032512Z	10.5	126.2	105	10.6	126.2	100.	6. -5.	11.7	123.9	60.	48.	-20.	12.7	121.4	55.	76.	0.	13.0	118.6	55.	84.	5.
032518Z	10.4	125.5	100	10.7	125.8	95.	25. -5.	11.9	123.4	60.	38.	-15.	12.8	120.7	55.	85.	10.	12.9	117.4	60.	67.	10.
032600Z	10.3	124.8	95	10.5	124.8	90.	12. -5.	11.7	122.0	65.	12.	0.	12.6	118.8	65.	21.	25.	13.5	115.0	60.	74.	15.
032606Z	10.5	124.0	85	10.7	124.2	85.	17. 0.	11.9	121.6	65.	19.	5.	12.8	118.0	65.	13.	20.	13.7	114.2	60.	100.	15.
032612Z	11.0	123.5	80	10.8	123.0	65.	32. -15.	11.8	119.6	60.	47.	5.	12.9	115.6	65.	97.	15.	13.9	111.6	65.	222.	25.
032618Z	11.5	122.9	75	11.2	122.2	65.	45. -10.	11.8	119.2	55.	21.	10.	12.9	115.3	65.	90.	15.	14.0	111.4	60.	204.	20.
032700Z	11.7	122.2	65	11.5	121.3	55.	54. -10.	13.1	117.4	60.	77.	20.	14.0	112.7	70.	198.	25.	14.2	108.0	30.	379.	-5.
032706Z	11.8	121.3	60	11.5	120.0	60.	78. 0.	12.8	115.9	70.	111.	25.	13.8	112.0	75.	223.	30.	13.8	108.0	30.	361.	0.
032712Z	11.9	120.4	55	11.8	120.2	60.	13. 5.	13.0	117.2	70.	18.	20.	14.2	113.4	75.	116.	35.	14.4	109.2	60.	285.	30.
032718Z	12.0	119.5	45	12.0	119.7	55.	12. 10.	13.2	116.9	65.	35.	15.	14.2	113.0	75.	111.	35.	14.4	108.8	50.	294.	20.
032800Z	12.4	118.5	40	12.3	118.6	45.	8. 5.	13.8	115.7	50.	29.	5.	15.2	112.7	50.	130.	15.	17.8	110.8	45.	336.	15.
032806Z	12.9	117.8	45	12.9	117.5	45.	18. 0.	15.0	113.7	45.	129.	0.	20.0	110.6	35.	425.	5.	0.0	0.0	0.	-0.	0.
032812Z	13.3	117.2	50	13.3	117.2	50.	0. 0.	15.7	113.8	50.	129.	10.	19.6	110.2	40.	426.	10.	0.0	0.0	0.	-0.	0.
032818Z	13.7	116.6	50	14.0	116.4	55.	21. 5.	16.2	112.7	55.	183.	15.	20.9	109.9	30.	511.	0.	0.0	0.0	0.	-0.	0.
032900Z	14.1	116.1	45	15.0	115.4	60.	68. 15.	18.5	111.2	50.	335.	15.	23.2	110.9	25.	637.	-5.	0.0	0.0	0.	-0.	0.
032906Z	14.3	115.8	45	14.7	115.7	55.	25. 10.	17.4	114.2	45.	216.	15.	21.4	113.7	35.	510.	5.	0.0	0.0	0.	-0.	0.
032912Z	14.2	115.4	40	15.1	115.3	50.	54. 10.	17.8	114.1	45.	258.	15.	22.2	113.8	30.	546.	0.	0.0	0.0	0.	-0.	0.
032918Z	14.0	114.9	40	13.8	114.9	40.	12. 0.	12.2	112.1	30.	111.	0.	11.1	107.5	20.	372.	-10.	0.0	0.0	0.	-0.	0.
033000Z	13.9	114.5	35	13.7	114.6	35.	13. 0.	12.3	111.7	30.	117.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033006Z	13.8	114.2	30	13.8	114.1	35.	6. 5.	13.6	112.2	30.	113.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033012Z	13.5	114.0	30	13.7	113.7	30.	21. 0.	13.2	111.8	20.	129.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033018Z	13.2	113.7	30	13.1	113.7	30.	6. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033100Z	12.9	113.6	30	12.4	113.8	20.	32. -10.	12.5	110.2	20.	173.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033106Z	12.9	114.0	30	12.9	113.2	30.	47. 0.	12.9	111.6	20.	60.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033112Z	13.1	114.0	30	12.4	113.8	25.	44. -5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
033118Z	13.1	113.5	30	12.4	113.8	20.	46. -10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040100Z	13.1	113.1	25	0.0	0.0	0.	-0. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040106Z	13.1	112.6	25	0.0	0.0	0.	-0. 0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	24.	95.	180.	170.	23.	85.	122.	152.
AVG RIGHT ANGLE ERROR	13.	57.	114.	72.	13.	47.	50.	49.
AVG INTENSITY MAGNITUDE ERROR	5.	11.	17.	21.	5.	12.	19.	22.
AVG INTENSITY BIAS	1.	1.	-4.	-6.	1.	0.	-5.	-9.
NUMBER OF FORECASTS	53	49	44	37	45	41	37	33

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 3063. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TYPHOON NELSON
FIX POSITIONS FOR CYCLONE NO. 2

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	180400	3.7N 160.9E	PCN 6	T1.5/1.5	INIT OBS	PGTW
2	180900	4.0N 160.1E	PCN 5			PGTW
3	181800	4.7N 157.7E	PCN 5			PGTW
4	190000	5.3N 155.5E	PCN 3	T2.5/2.5 /D1.0/25HRS		PGTW
5	190340	5.8N 154.3E	PCN 4			PGTW
6	190600	5.8N 153.9E	PCN 5			PGTW
7	190900	6.0N 152.6E	PCN 5			PGTW
8	191633	6.7N 150.7E	PCN 6			PGTW
9	192100	6.8N 150.0E	PCN 5			PGTW
10	200000	7.2N 149.6E	PCN 5	T3.0/3.0 /D0.5/24HRS		PGTW
11	200300	7.2N 149.3E	PCN 5			PGTW
12	200510	7.5N 149.1E	PCN 5			PGTW
13	201200	7.0N 147.4E	PCN 5.			PGTW
14	201621	7.2N 146.1E	PCN 5			PGTW
15	201800	7.2N 146.0E	PCN 5			PGTW
16	202100	7.2N 145.7E	PCN 5			PGTW
17	210000	7.3N 145.2E	PCN 5	T3.5/3.5 /D0.5/24HRS		PGTW
18	210300	7.5N 145.0E	PCN 5			PGTW
19	210506	8.2N 144.4E	PCN 5			PGTW
20	210600	8.5N 144.0E	PCN 5			PGTW
21	211200	7.8N 143.0E	PCN 5			PGTW
22	211600	8.0N 141.9E	PCN 5			PGTW
23	211751	8.0N 141.7E	PCN 6			PGTW
24	220000	8.3N 139.3E	PCN 5	T4.0/4.0 /D0.5/24HRS		PGTW
25	220300	8.5N 139.0E	PCN 5			PGTW
26	220454	8.5N 138.1E	PCN 5			PGTW
27	220600	8.5N 138.0E	PCN 3			PGTW
28	221200	8.6N 135.9E	PCN 5			PGTW
29	221600	8.3N 134.7E	PCN 5			PGTW
30	221740	9.0N 134.2E	PCN 5			PGTW
31	230000	8.8N 133.6E	PCN 5	T4.0/4.0 /S0.0/24HRS		PGTW
32	230600	9.3N 132.3E	PCN 5			PGTW
33	231200	9.4N 131.4E	PCN 5			PGTW
34	231720	9.5N 130.1E	PCN 6		BASED ON EXTRAP	PGTW
35	231720	9.3N 129.9E	PCN 6			RODN
36	232100	9.6N 129.6E	PCN 5			PGTW
37	240000	9.5N 129.5E	PCN 3	T4.5/4.5-/D0.5/24HRS		PGTW
38	240300	9.6N 129.2E	PCN 1		EYE DIA 5NM	PGTW
39	240613	9.8N 128.7E	PCN 1		EYE DIA 5NM	PGTW
40	241200	9.7N 128.2E	PCN 1			PGTW
41	241600	9.6N 127.8E	PCN 1			PGTW
42	241800	9.7N 127.6E	PCN 1			PGTW
43	242100	9.9N 127.4E	PCN 1			PGTW
44	250000	10.0N 127.3E	PCN 1	T5.0/5.0-/D0.5/24HRS	EYE DIA 10NM	PGTW
45	250300	10.1N 127.1E	PCN 1			PGTW
46	250601	10.1N 126.8E	PCN 1			PGTW
47	250900	10.3N 126.7E	PCN 1			PGTW
48	251200	11.1N 123.0E	PCN 5			PGTW
49	251200	10.3N 126.3E	PCN 1			PGTW
50	251800	10.4N 125.5E	PCN 1			PGTW
51	252100	10.4N 125.1E	PCN 1			PGTW
52	260000	10.3N 124.5E	PCN 3	T4.5/5.0 /W0.5/24HRS		PGTW
53	260300	10.4N 124.4E	PCN 1			PGTW
54	260600	10.4N 124.1E	PCN 5			PGTW
55	260900	10.7N 123.5E	PCN 5			PGTW
56	261600	11.1N 122.7E	PCN 5			PGTW
57	261800	11.1N 122.3E	PCN 5			PGTW
58	262100	11.4N 121.7E	PCN 5			PGTW
* 59	270000	11.3N 121.1E	PCN 5	T3.5/4.0 /W1.0/24HRS		PGTW
* 60	270300	11.0N 120.7E	PCN 5			PGTW
61	270600	11.1N 120.6E	PCN 5			PGTW
62	270719	11.1N 120.0E	PCN 5			RPMK
63	270900	11.2N 120.5E	PCN 5			PGTW
64	271200	11.7N 120.3E	PCN 5			PGTW
65	271600	11.7N 119.5E	PCN 5			PGTW
66	271822	11.9N 119.3E	PCN 5		BASED ON EXTRAP	PGTW
67	272100	12.3N 118.9E	PCN 5			PGTW
68	280000	12.5N 118.3E	PCN 5			PGTW
69	280300	12.8N 117.9E	PCN 5	T2.5/3.0 /W1.0/27HRS		PGTW
70	280600	12.8N 117.3E	PCN 5			PGTW
71	280706	13.0N 117.5E	PCN 5	T3.5/3.5	INIT OBS	RODN
72	280900	13.1N 117.3E	PCN 5			PGTW
73	281200	13.5N 116.9E	PCN 5			PGTW
74	281600	13.8N 116.4E	PCN 5			PGTW
75	281800	14.1N 116.2E	PCN 5			PGTW
76	282100	14.7N 115.9E	PCN 5			PGTW
* 77	290000	15.2N 115.8E	PCN 5		ULCC FIX	PGTW
78	290300	15.2N 116.1E	PCN 5	T2.5/2.5 /S0.0/24HRS		PGTW
79	290600	14.6N 116.0E	PCN 5			PGTW
80	290655	14.2N 115.5E	PCN 3	T3.0/3.0	INIT OBS	RPMK
81	290900	14.3N 115.9E	PCN 5		EXP LLCC	PGTW
82	291200	14.3N 115.4E	PCN 5			PGTW
83	291600	13.9N 115.1E	PCN 3		EXP LLCC	PGTW

84	291800	13.7N 115.0E	PCN 3			PGTW
85	291938	13.9N 115.2E	PCN 3		EXP LLCC	RPMK
86	291940	13.9N 115.0E	PCN 3		EXP LLCC	RODN
87	292100	13.7N 114.8E	PCN 3		EXP LLCC	PGTW
88	300000	14.1N 114.7E	PCN 3			PGTW
89	300300	14.0N 114.5E	PCN 3	T1.0/2.0 /W0.5/24HRS		PGTW
90	300600	13.9N 114.2E	PCN 3			PGTW
91	300643	13.8N 114.0E	PCN 3	T2.0/3.0 /W1.0/24HRS		RPMK
92	300900	13.5N 113.9E	PCN 3			PGTW
93	301600	13.1N 113.8E	PCN 3		EXP LLCC	PGTW
94	301800	13.2N 114.1E	PCN 3		EXP LLCC	PGTW
95	302100	13.1N 114.0E	PCN 3			PGTW
96	310000	13.0N 113.6E	PCN 3			PGTW
97	310300	13.0N 113.4E	PCN 5			PGTW
98	310630	12.8N 113.9E	PCN 3	T1.0/1.0 /S0.0/27HRS		PGTW
99	310631	12.7N 113.9E	PCN 3	T1.0/2.0 /W1.0/24HRS		RPMK
100	311600	12.7N 113.9E	PCN 5		EXP LLCC	PGTW
101	311800	13.1N 113.7E	PCN 5			PGTW
102	311916	13.3N 113.3E	PCN 5			RODN
103	312100	13.3N 113.5E	PCN 5			PGTW
104	010000	13.2N 113.1E	PCN 3			PGTW
105	010600	13.0N 112.6E	PCN 3			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL.	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	190615	5.9N 153.8E	700MB	3029		50 070 20	210 66 100 30	10 5				+12 +10 +10	1
2	191902	6.8N 150.8E	700MB	3031	996		080 47 010 10	7 3	CIRCULAR	20		+ 9 +14 + 8	2
3	192224	6.8N 150.1E	700MB	3032	992	35 130 8	240 35 130 11	5 4	CIRCULAR	15		+11 +14 + 9	2
4	200637	6.8N 148.6E	700MB	3052	994	40 030 10	060 46 330 8	5 1					3
5	200830	6.9N 148.2E	700MB	3073		30 150 5	250 37 140 6	2 1	CIRCULAR	5		+12 +15 +12	3
6	201917	7.2N 146.3E	700MB	3084			060 53 360 30	10 10					4
7	202145	7.5N 145.9E	700MB	3020	994	50 010 50	080 52 320 20	8 10	CIRCULAR	10		+11 +14 +10	4
8	210803	7.8N 144.1E	700MB	3033		50 360 6	070 47 320 29	10 4				+11 +14	5
9	212113	8.1N 140.5E	700MB	2870	973	65 360 8	140 60 360 8	2 5	CIRCULAR	15		+15 +17 +10	6
10	220631	8.4N 137.9E	700MB	2970	986	55 060 30	080 45 310 30	5 4	CIRCULAR	20		+14 +14 + 8	7
11	220909	8.7N 137.0E	700MB	2960	986	40 100 15	220 51 170 10	5 4	CIRCULAR	20		+11 +14 + 8	7
12	221910	9.0N 134.2E	700MB	2979			080 81 010 10	10 5	CIRCULAR	15			8
13	222211	9.0N 134.1E	700MB	2988	985	80 360 10	160 57 270 8	10 3	CIRCULAR	12		+11 +20 + 9	8
14	230645	9.2N 132.2E	700MB	2964	984	70 360 30	080 63 340 30	7 5	CIRCULAR	10		+13 +16 +11	9
15	230835	9.1N 131.8E	700MB	2966			200 55 130 30	10 7	CIRCULAR	12		+18 +12 +12	9
16	232210	9.5N 129.9E	700MB	2913	979		040 63 300 10	5 6	CIRCULAR	15		+13 +14 +12	10
17	240635	9.8N 128.0E	700MB	2696		80 220 5	310 70 240 20	10 2	CIRCULAR	15		+14 +16 +13	11
18	240830	9.8N 128.5E	700MB	2630	952	100 100 7	100 114 360 7	10 2	CIRCULAR	10		+14 +15 +11	11
19	250742	10.4N 126.8E	700MB	2510	934		060 107 360 10	5 5	CIRCULAR	8		+11 +17 +11	13
20	250920	10.3N 126.4E	700MB	2540	930		100 113 350 11	4 4	CIRCULAR	7		+14 +14	13
21	270934	11.8N 120.9E	700MB	3052		50 100 20	170 30 140 26	3 5				+11 +15 + 6	16
22	272002	12.2N 118.8E	700MB	3057			150 45 020 35	3 4					17
23	272259	12.3N 118.7E	700MB	3073	998		040 35 310 25	3 4	CIRCULAR	15		+10 +14 + 6	17
24	280705	12.8N 117.6E	700MB	3033		50 270 25	210 41 150 13	5 3	CIRCULAR	20		+12 +14 +10	18
25	281003	13.2N 117.4E	700MB	3005		50 360 15	240 60 150 11	5 3	CIRCULAR	12		+13 +14 +12	18

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	242300	10.2N 126.8E	LAND				65502 40000		10.3N 124.0E	98646
2	250200	10.3N 126.7E	LAND				50612 52905		10.3N 124.0E	98646
3	250300	10.3N 126.7E	LAND				50642 40000		10.3N 124.0E	98646
4	250600	10.3N 126.5E	LAND				50612 42910		10.3N 124.0E	98646
5	251100	10.7N 126.4E	LAND				10382 52910		10.3N 124.0E	98646
6	251500	10.9N 125.8E	LAND				14492 52909		10.3N 124.0E	98646
7	251600	10.9N 125.7E	LAND				10322 52708		10.3N 124.0E	98646
8	251700	10.8N 125.6E	LAND				14322 52700		10.3N 124.0E	98646
9	251800	10.7N 125.4E	LAND				14211 52608		10.3N 124.0E	98646
10	252000	10.5N 125.2E	LAND				14141 52508		10.3N 124.0E	98646
11	260000	10.3N 124.9E	LAND				5///1 42509		10.3N 124.0E	98646

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ODESSA
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
032806Z	3.5	156.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032812Z	4.3	156.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
032818Z	5.1	155.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032900Z	6.0	155.8	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032906Z	6.8	155.9	35	6.3	155.6	35.	35.	0.	7.7	153.6	40.	324.	-10.	8.3	150.5	50.	760.	0.	8.6	147.3	60.	923.	10.
032912Z	7.2	156.4	35	7.2	155.2	35.	71.	0.	9.3	153.7	55.	381.	5.	10.6	150.8	60.	784.	10.	10.3	146.2	60.	962.	5.
032918Z	7.6	157.0	35	7.6	156.0	40.	59.	5.	9.6	156.0	60.	313.	10.	11.2	154.3	65.	594.	15.	11.2	150.3	65.	696.	10.
033000Z	8.1	158.0	45	7.8	157.8	40.	22.	-5.	6.5	159.4	60.	216.	10.	6.2	157.2	65.	448.	15.	8.0	154.8	65.	435.	5.
033006Z	8.5	159.0	50	8.4	158.3	40.	42.	-10.	7.3	160.0	60.	218.	10.	7.4	157.6	65.	357.	15.	9.2	155.0	65.	369.	5.
033012Z	8.7	160.1	50	8.5	160.1	50.	12.	0.	7.3	160.1	60.	261.	10.	8.8	155.7	65.	416.	10.	10.6	149.0	70.	624.	10.
033018Z	8.7	161.2	50	9.2	161.2	50.	30.	0.	9.5	166.2	60.	116.	10.	9.2	170.0	65.	475.	10.	7.0	169.2	65.	650.	-5.
033100Z	8.8	162.2	50	9.6	162.2	55.	40.	5.	10.2	167.0	60.	207.	10.	9.2	170.8	65.	560.	5.	7.2	168.7	65.	645.	-10.
033106Z	8.9	163.3	50	9.0	163.2	55.	8.	5.	8.9	165.8	60.	199.	10.	8.8	167.3	65.	417.	5.	8.8	168.3	65.	564.	0.
033112Z	9.3	164.0	50	9.2	164.2	50.	13.	0.	9.2	168.3	50.	353.	-5.	9.6	172.6	45.	740.	-15.	10.6	176.6	40.	1051.	-15.
033118Z	10.0	164.3	50	9.2	164.8	50.	56.	0.	9.4	167.9	50.	351.	-5.	9.4	171.2	45.	696.	-25.	9.8	174.3	40.	1010.	-10.
040100Z	10.3	163.5	50	10.3	164.5	55.	59.	5.	11.4	166.9	55.	319.	-5.	12.1	169.4	55.	572.	-20.	14.3	171.8	55.	929.	15.
040106Z	10.4	162.8	50	10.8	162.4	50.	34.	0.	9.8	162.3	50.	135.	-10.	11.4	164.6	50.	296.	-15.	12.6	168.0	45.	784.	15.
040112Z	10.6	162.5	55	10.6	162.1	50.	24.	-5.	9.8	161.2	50.	148.	-10.	10.6	163.3	50.	302.	-5.	0.0	0.0	0.	-0.	0.
040118Z	10.7	162.1	55	10.6	161.8	50.	19.	-5.	9.9	161.2	50.	190.	-20.	10.3	163.5	50.	399.	0.	0.0	0.0	0.	-0.	0.
040200Z	11.0	161.5	60	10.8	161.8	55.	21.	-5.	11.8	160.0	60.	111.	-15.	12.6	162.5	65.	387.	25.	0.0	0.0	0.	-0.	0.
040206Z	11.5	160.8	60	11.6	161.0	65.	13.	5.	14.2	161.4	75.	65.	10.	15.6	165.3	70.	640.	40.	0.0	0.0	0.	-0.	0.
040212Z	12.1	160.3	60	12.2	160.2	65.	8.	5.	14.9	161.3	75.	173.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040218Z	12.8	159.9	70	12.6	159.8	65.	13.	-5.	15.3	160.1	75.	213.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040300Z	13.3	159.7	75	13.3	159.8	75.	6.	0.	15.8	160.8	75.	328.	35.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040306Z	14.0	160.3	65	13.3	159.6	60.	59.	-5.	11.6	157.2	35.	177.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040312Z	13.2	158.9	55	13.0	158.8	50.	13.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040318Z	13.0	157.3	50	12.8	157.6	45.	21.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040400Z	13.1	155.9	40	13.0	156.3	35.	24.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040406Z	13.1	154.6	30	13.2	154.6	30.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	29.	228.	520.	742.	30.	231.	513.	739.
AVG RIGHT ANGLE ERROR	16.	113.	226.	385.	17.	115.	221.	392.
AVG INTENSITY MAGNITUDE ERROR	3.	12.	14.	9.	4.	12.	12.	8.
AVG INTENSITY BIAS	-1.	4.	4.	3.	-1.	4.	2.	2.
NUMBER OF FORECASTS	25	21	17	13	24	20	16	12

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1528. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TYPHOON ODESSA
FIX POSITIONS FOR CYCLONE NO. 3

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	280300	3.4N 156.8E	PCN 5	T1.0/1.0	INIT OBS	PGTW
2	280600	3.4N 156.6E	PCN 5			PGTW
3	290000	6.0N 155.8E	PCN 5		ULCC FIX	PGTW
4	290300	6.2N 155.7E	PCN 5	T2.0/2.0 /D1.0/24HRS		PGTW
5	290900	6.7N 155.5E	PCN 5			PGTW
6	291200	6.9N 156.2E	PCN 5		BRKS CONTINUITY	PGTW
7	291615	7.3N 157.1E	PCN 6		BASED ON EXTRAP	PGTW
8	291800	7.6N 157.5E	PCN 5		BASED ON EXTRAP	PGTW
9	300000	7.9N 158.0E	PCN 5			PGTW
10	300300	8.4N 158.4E	PCN 5	T3.0/3.0-/D1.0/24HRS		PGTW
11	300600	8.4N 158.6E	PCN 5			PGTW
12	300900	8.8N 159.4E	PCN 5			PGTW
13	301600	9.0N 160.7E	PCN 5			PGTW
14	301603	9.1N 160.5E	PCN 6		ULAC FIX	KGWC
15	301800	9.3N 161.0E	PCN 5			PGTW
16	302053	9.1N 161.3E	PCN 6	T3.5/3.5 /D1.5/21HRS		KGWC
17	302053	8.9N 161.3E	PCN 5		POSSIBLE EYE	PKWA
18	302100	9.5N 161.7E	PCN 5			PGTW
19	310000	9.3N 162.4E	PCN 5	T3.0/3.0 /S0.0/21HRS		PGTW
20	310306	9.1N 162.4E	PCN 6			KGWC
21	311200	9.2N 164.3E	PCN 5			PGTW
22	311551	10.0N 164.0E	PCN 6			KGWC
23	311600	9.6N 164.5E	PCN 5			PGTW
24	311800	10.1N 164.6E	PCN 5			PGTW
25	312030	10.3N 164.0E	PCN 6	T4.0/4.0 /D0.5/24HRS		KGWC
26	312030	10.3N 163.5E	PCN 5			PKWA
27	010000	10.5N 164.7E	PCN 5			PGTW
28	010300	10.5N 163.2E	PCN 5	T4.0/4.0 /D1.0/27HRS		PGTW
29	010600	10.7N 162.4E	PCN 5			PGTW
30	010900	10.8N 162.4E	PCN 5			PGTW
31	011540	10.9N 162.1E	PCN 6			PGTW
32	011600	10.8N 162.1E	PCN 5			PGTW
33	011800	10.7N 161.8E	PCN 5			PGTW
34	012100	10.6N 161.8E	PCN 5			PGTW
35	020000	11.1N 161.6E	PCN 1		EYE DIA 10NM	PGTW
36	020300	11.4N 161.2E	PCN 1	T4.0/4.0 /S0.0/24HRS	EYE DIA 5NM	PGTW
37	020425	11.6N 161.1E	PCN 3			PGTW
38	020600	11.8N 160.9E	PCN 3			PGTW
39	020900	12.0N 160.4E	PCN 5			PGTW
40	021200	12.2N 160.3E	PCN 5			PGTW
41	021600	12.4N 159.9E	PCN 5			PGTW
42	021800	12.4N 160.1E	PCN 5			PGTW
43	022100	12.9N 159.9E	PCN 5			PGTW
44	030000	13.4N 159.5E	PCN 5		BASED ON EXTRAP	PGTW
45	030300	13.7N 159.5E	PCN 5	T3.0/4.0-/W1.0/24HRS		PGTW
46	030413	13.9N 159.0E	PCN 5			PGTW
47	030600	14.1N 160.1E	PCN 5			PGTW
48	030900	14.1N 160.0E	PCN 5			PGTW
49	031200	13.2N 158.8E	PCN 5		EXP LLCC	PGTW
50	031600	13.2N 157.4E	PCN 5			PGTW
51	031800	13.3N 157.0E	PCN 5			PGTW
52	040000	13.2N 155.9E	PCN 3		EXP LLCC	PGTW
53	040300	13.2N 155.2E	PCN 3	T0.5/2.0 /W2.5/24HRS	EXP LLCC	PGTW
54	040401	13.2N 154.9E	PCN 3		EXP LLCC	PGTW
55	040600	13.2N 154.6E	PCN 3		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	290320	6.2N 155.0E	1500FT		994	35 240 15	270 35 210 45	5 1	CIRCULAR	10	+25 +26 +24 28	1
2	292217	7.8N 157.6E	700MB	3038		35 180 10	070 31 350 25	7 5			+14 + 9	2
3	301140	8.6N 160.0E	700MB	2947	985		060 52 340 15	8 2			+16 +16 +10	3
4	310213	8.9N 162.5E	700MB	2990	989	45 250 10	350 43 200 40	15 3			+13 +17 + 8	4
5	310630	8.9N 163.2E	700MB	2999		40 060 10	030 42 320 30	10 5				5
6	310844	9.2N 163.5E	700MB	3015	989		340 51 240 20	10 5			+12 +19 + 8	5
7	312017	10.1N 164.0E	700MB	2973	985	60 090 15	170 47 030 8	5 5	CIRCULAR	8	+15 +23 +14	6
8	010037	10.5N 162.7E	700MB	2981	987		360 45 210 17	15 3	ELLIPTICAL	25 10 020	+12 +19 + 9	7
9	012126	10.8N 161.9E	700MB	2951	986	50 180 11	250 55 180 11	4 4			+13 +14 +12	8
10	020600	11.5N 160.0E	700MB	2897		65 090 6	180 72 090 6	5 5				9
11	020037	11.8N 160.4E	700MB	2933	977		230 68 160 15	10 5	CIRCULAR	10	+15 +19 + 8	9
12	022019	12.9N 160.0E	700MB	2906	964	80 050 4	100 79 020 12	5 2	ELLIPTICAL	15 10 090	+13 +21 + 7	10
13	030000	13.3N 159.5E	700MB	3091	999	50 300 15	110 27 010 60	10 2			+10 +19 + 4	11
14	032056	13.1N 156.5E	700MB	3115		25 040 35	270 23 210 30	10 8			+14 +14 + 5	12
15	032256	13.0N 156.3E	700MB	3127		35 320 60	100 23 320 60	10 6				12

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON PAT
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
051618Z	10.2	135.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051700Z	10.9	134.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051706Z	11.5	133.2	30	11.4	133.2	30.	6.	0.	12.5	129.1	40.	102.	0.	13.0	124.9	50.	144.	-15.	13.4	121.0	50.	375.	-50.
051712Z	11.6	131.6	30	12.0	132.2	30.	43.	0.	13.2	128.0	45.	71.	5.	13.5	124.2	50.	162.	-20.	13.7	120.5	45.	431.	-60.
051718Z	11.3	130.0	35	11.9	130.4	35.	43.	0.	12.0	125.9	55.	69.	5.	12.7	122.4	50.	289.	-35.	12.6	118.0	45.	599.	-60.
051800Z	11.2	128.6	35	10.8	128.2	35.	34.	0.	10.9	123.2	25.	266.	-30.	10.5	118.4	30.	557.	-65.	11.0	113.8	45.	941.	-55.
051806Z	11.5	127.7	40	10.8	126.8	40.	68.	0.	10.6	122.1	25.	334.	-40.	10.6	117.4	35.	636.	-65.	10.8	112.8	45.	1060.	-45.
051812Z	12.4	127.1	40	12.2	126.4	45.	43.	5.	12.5	121.5	35.	279.	-35.	12.7	117.4	40.	599.	-65.	13.5	113.3	45.	1040.	-40.
051818Z	13.8	126.5	50	13.8	125.8	45.	41.	-5.	15.0	121.7	55.	167.	-30.	16.5	117.7	45.	513.	-60.	16.9	113.7	50.	1029.	-25.
051900Z	14.6	125.7	55	15.2	125.6	45.	36.	-10.	20.9	125.2	50.	189.	-45.	25.5	130.0	50.	359.	-50.	20.3	137.2	45.	363.	-25.
051906Z	15.4	125.0	65	15.6	124.5	55.	31.	-10.	19.3	122.4	65.	132.	-35.	24.5	125.9	65.	243.	-25.	20.2	133.2	45.	254.	-20.
051912Z	16.2	124.4	70	16.4	124.1	65.	21.	-5.	21.1	124.2	70.	122.	-35.	25.0	129.0	65.	193.	-23.	20.2	137.2	55.	171.	0.
051918Z	17.2	124.2	85	17.3	123.8	65.	24.	-20.	21.0	124.2	70.	157.	-35.	25.5	129.5	60.	209.	-15.	27.8	137.9	50.	145.	0.
052000Z	17.9	124.2	95	17.8	124.0	95.	13.	0.	21.5	125.5	100.	115.	0.	26.2	132.7	65.	163.	-5.	0.0	0.0	0.	-0.	0.
052006Z	18.6	124.6	100	18.9	124.6	100.	10.	0.	23.0	128.2	90.	127.	0.	27.3	130.2	60.	222.	-5.	0.0	0.0	0.	-0.	0.
052012Z	19.3	125.2	105	19.3	125.1	100.	6.	-5.	23.0	126.2	85.	94.	0.	27.1	137.2	55.	107.	0.	0.0	0.0	0.	-0.	0.
052018Z	19.8	126.0	105	20.0	125.6	105.	26.	0.	23.8	129.4	80.	126.	5.	27.8	139.2	50.	95.	0.	0.0	0.0	0.	-0.	0.
052100Z	20.2	127.0	100	20.3	126.8	100.	13.	0.	24.3	132.9	70.	49.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052106Z	20.9	127.9	90	21.0	128.0	95.	8.	5.	25.8	134.8	65.	87.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052112Z	21.8	129.3	85	21.8	129.1	90.	11.	5.	27.8	137.2	60.	148.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052118Z	22.3	131.0	75	22.8	130.7	75.	34.	0.	29.8	141.2	50.	205.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052200Z	23.5	133.1	70	23.7	133.0	70.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052206Z	24.5	135.5	65	25.2	135.7	65.	43.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052212Z	25.4	137.8	55	25.8	137.7	55.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052218Z	26.5	140.2	50	27.2	140.7	50.	50.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	28.	149.	299.	583.	29.	149.	299.	583.
AVG RIGHT ANGLE ERROR	24.	134.	237.	394.	24.	134.	237.	394.
AVG INTENSITY MAGNITUDE ERROR	3.	16.	30.	35.	3.	16.	30.	35.
AVG INTENSITY BIAS	-2.	-14.	-30.	-35.	-2.	-14.	-30.	-35.
NUMBER OF FORECASTS	23	19	15	11	21	19	15	11

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1994. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 14. KNOTS

TYPHOON PAT
FIX POSITIONS FOR CYCLONE NO. 4

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	141000	12.6N 141.2E	PCN 5		ULAC FIX	PGTW
2	160547	9.3N 137.3E	PCN 5	T1.0/1.0	INIT OBS	PGTW
3	161200	9.7N 136.4E	PCN 5		ULCC FIX	PGTW
4	161600	9.9N 135.5E	PCN 5		ULCC FIX	PGTW
5	161832	10.7N 135.1E	PCN 5		ULCC FIX	PGTW
6	170300	11.4N 133.8E	PCN 3			PGTW
7	170535	11.6N 133.4E	PCN 5	T1.5/1.5 /D0.5/24HRS		PGTW
8	170900	11.0N 132.6E	PCN 5		ULCC FIX	PGTW
9	171200	12.0N 132.1E	PCN 5			PGTW
10	171600	11.5N 130.3E	PCN 5			PGTW
11	171800	11.5N 129.6E	PCN 5			PGTW
12	172100	11.2N 128.2E	PCN 5			PGTW
13	180000	11.1N 128.4E	PCN 5			PGTW
14	180523	11.2N 127.6E	PCN 3	T3.0/3.0-/D1.5/24HRS		PGTW
15	180900	11.6N 127.4E	PCN 5			PGTW
16	181200	12.2N 127.1E	PCN 5			PGTW
17	181600	13.6N 126.5E	PCN 5			PGTW
18	181800	14.1N 126.3E	PCN 5			PGTW
19	181800	13.9N 126.1E	PCN 5			PGTW
20	182100	14.5N 125.6E	PCN 5		ULCC FIX	PGTW
21	190000	14.7N 125.6E	PCN 5			PGTW
22	190300	15.1N 124.6E	PCN 3			PGTW
23	190600	15.4N 124.5E	PCN 3	T3.5/3.5 /D0.5/25HRS		PGTW
24	190900	15.9N 124.8E	PCN 3			PGTW
25	191200	16.2N 124.3E	PCN 5			PGTW
26	191600	16.5N 123.0E	PCN 5			PGTW
27	191756	17.0N 124.1E	PCN 3			PGTW
28	191800	17.0N 123.9E	PCN 3		EYE FORMING	PGTW
29	192100	17.4N 124.0E	PCN 1			PGTW
30	200000	17.7N 124.3E	PCN 1		BANDING EYE	PGTW
31	200600	18.5N 124.5E	PCN 1	T5.5/5.5 /D2.0/24HRS		PGTW
32	200641	18.4N 124.7E	PCN 1	T5.0/5.0	INIT OBS	RODN
33	200900	19.0N 124.9E	PCN 1			PGTW

34	201200	19.3N 125.1E	PCN 1			PGTW
35	201600	19.6N 125.3E	PCN 1		EYE DIA 30NM	PGTW
36	201800	19.7N 125.7E	PCN 1			PGTW
37	201926	19.8N 125.9E	PCN 1			RPMK
38	202100	19.9N 126.3E	PCN 1			PGTW
39	210000	20.3N 127.0E	PCN 1			PGTW
40	210300	20.7N 127.3E	PCN 1	T6.0/6.0-/D0.5/21HRS		PGTW
41	210600	21.0N 128.2E	PCN 1			PGTW
42	210629	21.0N 128.3E	PCN 1	T5.5/5.5 /S0.0/24HRS		RODN
43	210900	21.4N 129.0E	PCN 1			PGTW
44	211200	21.9N 129.4E	PCN 5			PGTW
45	211600	22.2N 130.6E	PCN 5		ULCC FIX	PGTW
46	211800	22.5N 131.4E	PCN 5		ULCC FIX	PGTW
47	212100	23.3N 132.2E	PCN 5		ULCC FIX	PGTW
48	220000	24.0N 133.1E	PCN 5		ULCC FIX	PGTW
49	220300	24.4N 134.6E	PCN 5	T4.0/4.5 /W2.0/24HRS	ULCC FIX	PGTW
50	220435	24.6N 135.4E	PCN 5			PGTW
51	220600	24.5N 135.9E	PCN 5		ULCC FIX	PGTW
52	220900	25.0N 137.0E	PCN 5			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	170323	11.3N 133.0E	1500FT		1004	25 330 30	150 39 090 40	5 7				3
2	172231	10.9N 128.0E	700MB	3058	999	35 340 10	040 37 300 20	20 20			+12 +12 +11	4
3	180940	12.1N 127.4E	700MB	2993	990	40 250 20	270 50 150 15	15 10			+11 +13 +13	5
4	190755	15.3N 124.9E	700MB	2854		50 210 30	060 75 320 14					6
5	191009	16.2N 124.3E	700MB	2842	970	65 120 45	150 80 100 67	5 2	CIRCULAR	15	+15 +14 +13	6
6	192233	17.6N 124.1E	700MB	2664	949	80 140 10	170 94 090 15	10 2	CIRCULAR	20	+13 +19 + 8	7
7	200200	18.5N 124.5E	700MB	2623	944	65 360 5	030 84 270 8	5 7	CIRCULAR	15	+15 +19 + 6	7
8	200823	18.8N 124.8E	700MB	2594		65 120 30	200 99 200 30					8
9	201003	18.7N 124.9E	700MB	2600	943	65 090 45	190 92 040 15	15 10	CIRCULAR	20	+12 +18 +14	8
10	202027	20.1N 126.3E	700MB	2631		65 130 60	340 100 260 37					9
11	202307	20.2N 126.7E	700MB	2634	947	100 270 10	030 90 290 9	3 3	ELLIPTICAL	30 23 050	+11 +16 +14	9
12	210700	21.1N 128.1E	700MB	2625		80 180 30	270 103 180 30	5 1				10
13	210913	21.4N 128.5E	700MB	2656	952	80 210 5	220 69 230 30	10 3			+11 +21 +16	10
14	212001	23.0N 131.7E	700MB	2769	968	80 180 60	280 93 180 60	10 10			+14 +19 +15	11
15	220926	25.8N 137.0E	700MB	2928	988	65 220 35	310 37 170 30	3 10				12
16	220952	25.1N 136.8E	700MB	2896		65 320 10	270 75 160 36	3 3			+11 +16 + 9	12

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	182000	14.2N 126.0E	LAND				22273 53214		14.0N 124.3E	98447
2	182100	14.5N 125.8E	LAND				22272 53316		14.0N 124.3E	98447
3	182200	14.6N 125.6E	LAND				22882 53114		14.0N 124.3E	98447
4	182300	14.8N 125.4E	LAND				22813 43218		14.0N 124.3E	98447
5	190100	15.2N 125.1E	LAND				22813 53210		14.0N 124.3E	98447
6	200200	18.4N 123.8E	LAND				30494 53603		14.0N 124.3E	98447

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
* 1	221800	27.0N 142.5E	040	090	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON RUBY
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
061806Z	9.3	140.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061812Z	9.3	147.4	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061818Z	9.3	146.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
061900Z	9.2	145.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061906Z	9.2	144.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061912Z	9.1	142.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061918Z	9.1	141.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062000Z	9.0	140.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062006Z	9.0	140.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062012Z	9.0	139.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062018Z	9.2	138.8	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062100Z	9.6	139.1	30	9.6	139.2	35.	6.	5.	10.3	137.0	50.	312.	15.	11.6	134.2	65.	565.	25.	13.4	130.6	80.	703.	25.
062106Z	9.5	139.7	35	9.6	138.9	35.	48.	0.	10.3	137.3	45.	347.	10.	11.3	134.7	60.	567.	15.	12.7	131.9	75.	651.	15.
062112Z	9.6	140.5	35	9.5	139.9	35.	36.	0.	10.0	139.5	50.	290.	15.	11.0	138.2	60.	427.	15.	11.7	135.8	70.	543.	5.
062118Z	10.2	141.4	35	10.2	139.8	40.	94.	5.	11.4	138.2	55.	334.	15.	12.4	136.5	65.	432.	15.	13.4	134.2	75.	549.	10.
062200Z	11.3	142.2	35	11.2	142.3	45.	8.	10.	14.8	143.3	60.	0.	20.	17.9	142.9	75.	57.	20.	21.2	145.7	70.	319.	0.
062206Z	12.4	142.8	35	11.9	142.8	45.	30.	10.	15.5	143.2	60.	13.	15.	19.4	143.5	70.	130.	10.	22.4	147.8	65.	466.	-5.
062212Z	13.3	143.1	35	13.6	143.2	45.	19.	10.	17.2	141.7	55.	97.	10.	21.1	140.2	55.	133.	-10.	24.8	143.6	50.	240.	-25.
062218Z	14.1	143.2	40	14.6	143.2	45.	30.	5.	18.2	141.5	55.	99.	5.	21.3	139.6	50.	87.	-15.	24.9	141.8	40.	139.	-35.
062300Z	14.8	143.3	40	15.4	143.1	50.	38.	10.	18.2	141.1	60.	66.	5.	21.4	139.3	60.	39.	-10.	24.8	141.9	50.	183.	-25.
062306Z	15.7	143.3	45	15.4	143.2	60.	19.	15.	18.0	143.3	70.	90.	10.	20.9	143.0	75.	266.	5.	23.6	146.7	65.	406.	-5.
062312Z	16.3	143.1	45	16.4	143.5	60.	24.	15.	19.6	143.1	70.	112.	5.	22.8	143.2	75.	226.	0.	26.1	144.6	65.	397.	0.
062318Z	16.8	142.4	50	17.2	142.8	60.	33.	10.	20.4	141.9	70.	74.	5.	23.5	141.8	75.	178.	0.	0.0	0.0	0.	-0.	0.
062400Z	17.5	142.0	55	17.6	141.8	60.	13.	5.	19.8	139.2	70.	106.	0.	22.4	136.2	70.	348.	-5.	0.0	0.0	0.	-0.	0.
062406Z	18.2	141.6	60	18.7	141.4	55.	32.	-5.	21.5	138.7	50.	77.	-20.	25.0	136.8	45.	334.	-25.	0.0	0.0	0.	-0.	0.
062412Z	19.1	141.2	65	19.9	140.9	60.	51.	-5.	23.0	138.2	50.	62.	-25.	27.1	138.2	45.	343.	-20.	0.0	0.0	0.	-0.	0.
062418Z	20.2	140.6	65	20.2	140.7	60.	6.	-5.	23.5	138.3	70.	126.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062500Z	21.4	140.0	70	21.2	140.0	65.	12.	-5.	25.7	137.9	70.	136.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062506Z	22.6	139.4	70	22.2	139.2	65.	26.	-5.	27.0	138.2	75.	193.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062512Z	24.0	139.3	75	23.6	139.2	70.	25.	-5.	29.2	140.2	70.	185.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062518Z	25.4	139.3	75	24.8	139.2	75.	36.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062600Z	27.2	139.8	75	27.1	139.8	75.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062606Z	29.5	140.5	70	29.6	140.6	70.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062612Z	32.1	141.4	65	32.2	141.1	65.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	27.	144.	275.	425.	28.	144.	275.	425.
AVG RIGHT ANGLE ERROR	12.	64.	143.	326.	12.	64.	143.	326.
AVG INTENSITY MAGNITUDE ERROR	6.	10.	13.	14.	6.	10.	13.	14.
AVG INTENSITY BIAS	3.	4.	1.	-4.	3.	4.	1.	-4.
NUMBER OF FORECASTS	23	19	15	11	22	19	15	11

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2173. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TYPHOON RUBY
FIX POSITIONS FOR CYCLONE NO. 5

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	192100	8.9N 141.1E	PCN 5			PGTW
2	200000	9.2N 140.7E	PCN 5			PGTW
3	200300	9.2N 140.1E	PCN 5	T1.0/1.0	INIT OBS	PGTW
4	200600	9.3N 139.5E	PCN 5			PGTW
5	200900	9.4N 139.5E	PCN 5			PGTW
6	201200	9.3N 139.4E	PCN 5			PGTW
7	201600	9.2N 139.0E	PCN 5			PGTW
8	201800	9.2N 138.4E	PCN 5			PGTW
9	202100	9.4N 138.1E	PCN 5			PGTW
10	210000	9.5N 138.8E	PCN 5			PGTW
11	210300	9.2N 139.1E	PCN 5	T1.0/1.0 /S0.0/24HRS		PGTW
12	210600	9.3N 139.5E	PCN 5			PGTW
13	210900	9.2N 140.1E	PCN 5			PGTW
14	211200	9.6N 139.5E	PCN 5			PGTW
* 15	211600	10.5N 140.0E	PCN 5			PGTW
* 16	211800	10.7N 139.9E	PCN 5			PGTW
* 17	212100	10.0N 139.3E	PCN 5			PGTW
18	220000	11.2N 142.4E	PCN 5		BASED ON EXTRAP	PGTW
19	220300	11.5N 142.2E	PCN 6	T2.5/2.5 /D1.5/24HRS		PGTW
20	220509	12.0N 142.8E	PCN 5			PGTW
21	220900	12.6N 142.7E	PCN 6			PGTW
22	221200	13.5N 143.3E	PCN 6			PGTW

23	221600	13.8N 143.3E	PCN 6			PGTW
24	221800	14.4N 143.2E	PCN 6			PGTW
25	222100	14.7N 143.2E	PCN 6			PGTW
26	230000	14.8N 143.1E	PCN 4			PGTW
27	230300	15.0N 143.4E	PCN 4	T4.0/4.0 /D1.5/24HRS		PGTW
28	230457	15.4N 143.7E	PCN 4			PGTW
29	230600	15.7N 143.5E	PCN 4			PGTW
30	230900	16.1N 143.3E	PCN 4			PGTW
31	231200	16.6N 143.2E	PCN 6			PGTW
32	231600	17.0N 142.4E	PCN 6			PGTW
* 33	231800	17.5N 141.9E	PCN 4			PGTW
34	232100	17.1N 141.8E	PCN 6			PGTW
35	240000	17.0N 142.3E	PCN 6			PGTW
36	240300	17.6N 142.2E	PCN 6	T4.0/4.0 /S0.0/24HRS		PGTW
* 37	240445	19.3N 142.0E	PCN 6		ULCC 17.8N 142.1E	PGTW
* 38	240600	19.4N 141.6E	PCN 6		ULCC 18.0N 141.8E	PGTW
39	240900	18.4N 141.3E	PCN 6		ULCC FIX	PGTW
40	241200	18.7N 140.8E	PCN 6		ULCC FIX	PGTW
41	241600	19.5N 140.3E	PCN 6		ULCC FIX	PGTW
42	241730	20.2N 140.8E	PCN 6		ULCC FIX	PGTW
43	242032	21.1N 140.7E	PCN 6		ULCC FIX	PGTW
44	242100	21.0N 140.4E	PCN 6			PGTW
45	250000	21.6N 140.1E	PCN 4			PGTW
46	250300	21.9N 139.7E	PCN 4	T4.5/4.5-/D0.5/24HRS		PGTW
47	250600	23.0N 139.9E	PCN 2			PGTW
48	250900	23.2N 139.7E	PCN 2			PGTW
49	251200	24.0N 139.8E	PCN 4			PGTW
50	251600	24.6N 139.6E	PCN 4			PGTW
51	251718	25.3N 139.5E	PCN 4			PGTW
52	251800	25.3N 139.6E	PCN 4			PGTW
53	252100	26.7N 140.0E	PCN 4		ULCC FIX	PGTW
54	260000	27.6N 140.2E	PCN 6			PGTW
55	260300	28.8N 140.7E	PCN 6	T3.5/4.5 /W1.0/24HRS		PGTW
* 56	260421	29.4N 141.1E	PCN 5			PGTW
57	260600	30.1N 141.4E	PCN 6			PGTW
58	260900	31.4N 142.2E	PCN 6			PGTW
59	261200	32.4N 142.7E	PCN 6		ULCC FIX	PGTW
60	261600	33.3N 143.0E	PCN 6			PGTW
61	270000	36.0N 143.7E	PCN 6			PGTW
62	270300	37.0N 143.8E	PCN 6			PGTW
63	270600	37.9N 144.7E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY HAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	202339	9.6N 139.2E	700MB	3097	995	60 100 15	070 33 040 15	3 2			+12 +13 + 9	1
2	210830	9.3N 139.9E	700MB	3062	995	45 070 10	340 26 260 15	3 10			+11 +16 + 8	2
3	220633	12.5N 142.8E	700MB	3076		40 150 30	220 26 150 30					4
4	220838	13.0N 143.0E	700MB	3070	1003	40 160 40	230 41 120 120	2 10			+10 +13 + 9	4
5	231959	16.9N 142.0E	700MB	3000			130 42 040 120					5
6	232044	17.0N 142.0E	700MB	2993	989	60 130 95	210 49 130 90	5 10	ELLIPTICAL	30 10 360	+10 +13 +10	5
.	240809	18.5N 141.4E	700MB	2989	989	65 150 70	180 60 060 90	10 10			+12 +13 + 9	6
8	250630	22.9N 139.3E	700MB	2905		45 260 90	330 52 260 90					8
9	250911	22.7N 139.2E	700MB	2841	977	65 240 15	210 95 100 70	5 15			+12 +16	8
10	251914	25.8N 139.4E	700MB	2887			230 70 170 95					9
11	252157	26.2N 139.7E	700MB	2912	980	40 090 8	290 62 220 60	10 10			+12 +14 +13	9
12	260602	29.6N 140.5E	700MB	2823		55 160 50	210 94 090 60					10
13	260812	30.3N 140.7E	700MB	2025	972	50 270 60	350 56 270 60	5 8			+14 +13	10
14	261929	35.0N 142.2E	700MB	2047			190 72 090 120					11
15	262149	35.5N 142.7E	700MB	2837		65 260 60	090 71 350 70	5 4			+ 9 + 9 + 9	11

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM TESS
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR FORECAST WIND	24 HOUR FORECAST ERRORS DST	24 HOUR FORECAST ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR FORECAST ERRORS DST	48 HOUR FORECAST ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR FORECAST ERRORS DST	72 HOUR FORECAST ERRORS WIND
062800Z	17.2	113.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062806Z	17.5	113.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062812Z	17.9	113.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062818Z	18.2	112.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062900Z	18.5	112.7	30	18.0	113.0	30.	35.	0.	19.0	114.3	40.	113.	10.	19.0	115.2	45.	116.	15.	21.3	115.7	50.	144.	25.
062906Z	18.8	112.4	30	18.9	112.4	30.	6.	0.	20.4	111.4	30.	96.	0.	22.2	111.0	25.	240.	-5.	0.0	0.0	0.	-0.	0.
062912Z	19.2	112.4	30	19.2	112.2	30.	11.	0.	20.8	111.2	30.	135.	-5.	22.3	110.8	20.	295.	-10.	0.0	0.0	0.	-0.	0.
062918Z	19.6	112.4	30	19.5	112.0	30.	23.	0.	20.9	111.0	30.	175.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063000Z	20.0	112.6	30	20.1	112.3	30.	10.	0.	21.7	112.6	30.	123.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063006Z	20.5	113.1	30	20.5	112.8	30.	17.	0.	22.2	113.7	30.	91.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063012Z	20.9	113.6	35	21.0	113.7	30.	0.	-5.	22.8	114.3	20.	100.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	6.	-0.	0.
063018Z	21.2	114.1	35	21.4	114.1	30.	12.	-5.	23.2	114.9	20.	123.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070100Z	21.7	114.8	30	21.6	114.5	35.	10.	5.	23.0	116.8	0.	50.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070106Z	21.9	115.3	30	22.2	115.5	35.	21.	5.	23.9	118.2	35.	45.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070112Z	22.1	116.1	30	22.4	116.2	35.	19.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070118Z	22.3	116.9	25	22.3	116.7	30.	11.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070200Z	22.7	117.8	25	22.8	117.8	25.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070206Z	23.2	118.5	20	23.2	118.5	20.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	ALL FORECASTS 24-HR	ALL FORECASTS 48-HR	ALL FORECASTS 72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	107.	217.	144.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	9.	73.	142.	41.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	8.	10.	25.	0.	0.	0.	0.
AVG INTENSITY BIAS	1.	-3.	0.	25.	0.	0.	0.	0.
NUMBER OF FORECASTS	14	10	3	1	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 585. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 6. KNOTS

TROPICAL STORM TESS
FIX POSITIONS FOR CYCLONE NO. 6

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
*	1	272100	17.6N 111.3E	PCN 6			PGTW
*	2	280300	16.6N 110.7E	PCN 6		ULCC FIX	PGTW
*	3	280721	18.1N 112.5E	PCN 5	T1.5/1.5	INIT OBS	RPMK
*	4	280721	17.5N 112.0E	PCN 5			RODN
	5	280900	17.4N 111.4E	PCN 6		ULCC FIX	PGTW
*	6	281200	16.7N 111.3E	PCN 6		ULCC FIX	PGTW
*	7	281600	16.5N 109.7E	PCN 6		ULCC FIX BRKS CONTINUITY	PGTW
*	8	281800	16.2N 109.2E	PCN 6		ULCC FIX	PGTW
*	9	282006	18.0N 114.1E	PCN 6			RPMK
*	10	282100	16.0N 109.0E	PCN 6		ULCC FIX	PGTW
*	11	282223	17.4N 116.9E	PCN 6	T1.0/1.0	INIT OBS	RODN
*	12	290300	18.5N 113.2E	PCN 6		1515 INIT OBS	PGTW
	13	290600	18.6N 113.0E	PCN 6			PGTW
	14	290700	19.3N 112.2E	PCN 6			RODN
	15	290709	19.2N 113.3E	PCN 5	T1.5/1.5 /S0.0/24HRS		RPMK
	16	290900	19.2N 111.9E	PCN 6		ULCC FIX	PGTW
*	17	291200	18.2N 111.5E	PCN 6			PGTW
*	18	291600	18.3N 111.2E	PCN 6			PGTW
*	19	291800	18.0N 110.7E	PCN 6			PGTW
*	20	291953	19.0N 111.0E	PCN 5			RPMK
	21	291953	20.2N 112.1E	PCN 6			RODN
*	22	292100	20.2N 111.3E	PCN 6			PGTW
	23	300000	20.0N 113.5E	PCN 6		ULCC 20.3N 111.5E	PGTW
	24	300300	20.2N 112.9E	PCN 4	T1.5/1.5-/S0.0/24HRS		PGTW
	25	300600	20.4N 113.7E	PCN 4			PGTW

*	26	300656	21.0N 114.1E	PCN 3	T1.5/1.5-/S0.0/24HRS	EXP LLCC	RPMK
	27	300900	21.4N 112.7E	PCN 6		ULCC FIX	PGTW
*	28	301200	21.4N 112.3E	PCN 6		ULCC FIX	PGTW
*	29	301600	21.5N 111.7E	PCN 6		ULCC FIX	PGTW
*	30	301800	21.9N 111.5E	PCN 6		ULCC FIX	PGTW
	31	301941	22.5N 113.5E	PCN 5			RPMK
*	32	010000	22.5N 113.2E	PCN 6		ULCC FIX	PGTW
*	33	010300	22.5N 114.1E	PCN 6	T2.5/2.5 /D1.0/24HRS		PGTW
	34	010600	21.9N 114.0E	PCN 6			PGTW
	35	010644	22.6N 115.3E	PCN 5	T1.5/1.5-/S0.0/24HRS		RPMK
	36	010900	22.0N 115.6E	PCN 6			PGTW
	37	011200	21.9N 116.1E	PCN 6		ULCC FIX	PGTW
	38	011600	22.0N 116.1E	PCN 6			PGTW
	39	011800	22.0N 116.5E	PCN 6			PGTW
	40	020000	22.0N 117.5E	PCN 6			PGTW

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
* 1	281200	19.3N 114.0E	30	210	
* 2	292100	21.2N 113.0E	30	110	
* 3	300300	21.3N 114.0E	30	75	
* 4	300900	21.6N 114.0E	30	50	
* 5	301600	21.5N 113.7E	30	60	
* 6	302100	21.8N 114.5E	35	40	
* 7	010300	21.5N 115.0E	35	60	
* 8	010900	21.8N 116.3E	35	90	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM SKIP
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
062906Z	21.7	131.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062912Z	22.2	133.5	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062918Z	22.9	135.4	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063000Z	24.1	137.2	40	24.2	137.3	45.	8.	5.	27.6	146.2	35.	39.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063006Z	25.1	138.9	40	25.2	139.1	45.	12.	5.	27.8	147.4	35.	131.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063012Z	26.0	141.1	45	26.0	141.0	45.	5.	0.	30.0	149.3	30.	114.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
063018Z	26.8	143.7	45	26.8	143.2	40.	27.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070100Z	28.2	146.5	50	28.2	146.7	40.	11.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070106Z	29.4	149.1	45	29.6	149.3	40.	16.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070112Z	30.8	151.3	45	31.0	151.9	40.	33.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	16.	95.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	15.	32.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	5.	13.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	-13.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	7	3	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1197. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 22. KNOTS

TROPICAL STORM SKIP
FIX POSITIONS FOR CYCLONE NO. 7

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	290526	22.7N 132.8E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	290900	21.8N 132.4E	PCN 6		ULCC FIX	PGTW
3	291200	21.8N 132.8E	PCN 6			PGTW
4	291600	22.1N 134.2E	PCN 6			PGTW
5	291811	22.5N 135.8E	PCN 5			PGTW
6	291811	22.8N 135.7E	PCN 5			RPMK
7	292100	23.7N 136.6E	PCN 6			PGTW
8	300000	24.2N 137.0E	PCN 4			PGTW
9	30030[illegible]	24.5N 137.4E	PCN 4	T2.5/2.5 /D1.5/22HRS		PGTW
10	3005[illegible]	24.9N 138.8E	PCN 3			PGTW
11	300600	25.0N 139.1E	PCN 4			PGTW
12	300900	25.7N 140.7E	PCN 6		ULCC FIX	PGTW
13	301200	25.9N 142.1E	PCN 6			PGTW
14	301600	26.3N 144.0E	PCN 6			PGTW
* 15	301800	26.5N 145.0E	PCN 6			PGTW
* 16	302100	27.1N 146.6E	PCN 6			PGTW
17	010000	28.5N 147.4E	PCN 6		BRKS CONTINUITY	PGTW
18	010300	28.9N 147.8E	PCN 6	T3.0/3.0-/D0.5/24HRS		PGTW
19	010600	29.4N 148.8E	PCN 6			PGTW
* 20	010900	30.1N 152.0E	PCN 6		BRKS CONTINUITY	PGTW
21	011200	31.0N 152.2E	PCN 6			PGTW
22	011600	31.3N 152.5E	PCN 4		EXP LLCC	PGTW
23	011800	31.6N 153.6E	PCN 4		EXP LLCC	PGTW
24	012100	32.0N 154.9E	PCN 4		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	300136	24.3N 137.6E	1500FT		991	40 210 70	210 56 170 45	10 3			+24 +23 +18 29	1
2	300933	25.6N 140.0E	700MB	3016		40 140 30	270 53 150 60	10 6			+13 +16 + 6	2
3	301959	28.1N 144.9E	700MB	3024		50 200 90	270 50 200 90					3
* 4	302156	28.9N 144.7E	700MB	3050		45 150 120	200 46 150 120	15 15			+ 9 + 9 + 4	3
5	010900	30.7N 150.7E	700MB	3023	995	45 190 120	200 60 190 90	15 15			+11 +13 +12	4

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	301600	26.5N 142.5E	40	40	WMO 47981

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM VAL
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
070200Z	24.3	123.3	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070206Z	24.3	123.9	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070212Z	24.3	124.3	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070218Z	24.3	125.6	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070300Z	24.0	127.0	55	24.0	127.0	45.	0.	-10.	26.9	132.0	55.	363.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070306Z	26.2	129.9	50	26.2	129.9	50.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070312Z	27.7	132.3	45	27.5	131.9	50.	24.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070318Z	28.9	135.1	45	28.9	134.5	50.	32.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
070400Z	29.7	130.1	35	30.0	136.9	50.	91.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	29.	363.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	22.	33.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	7.	20.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	20.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	1	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 876. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 18. KNOTS

TROPICAL STORM VAL
FIX POSITIONS FOR CYCLONE NO. 8

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	020000	24.9N 125.1E	PCN 6	T0.5/0.5	INIT OBS	PGTW
* 2	020300	25.4N 125.5E	PCN 6			PGTW
* 3	020900	25.3N 126.1E	PCN 6		ULCC FIX	PGTW
4	021600	23.3N 125.6E	PCN 6		ULCC FIX	PGTW
5	021800	23.7N 125.7E	PCN 6		ULCC FIX	PGTW
6	030000	24.8N 127.0E	PCN 6		BASED ON EXTRAP	PGTW
7	030300	25.6N 128.9E	PCN 6	T2.5/2.5	INIT OBS	PGTW
8	030600	26.2N 129.9E	PCN 6		BASED ON EXTRAP	PGTW
9	030900	27.2N 131.0E	PCN 6		BASED ON EXTRAP	PGTW
10	031200	27.6N 132.3E	PCN 6		ULCC FIX	PGTW
11	031600	28.0N 134.5E	PCN 6			PGTW
12	031723	28.1N 135.4E	PCN 5		ULCC FIX	PGTW
13	032100	29.2N 137.5E	PCN 6			PGTW
14	040000	29.4N 138.2E	PCN 6		ULCC 29.6N 139.7E	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
* 1	020215	25.1N 124.2E	1500FT		95+	351 910 000	3 0 312 2 0 009	2 20			24+ 26+ 242 9	1
2	022354	24.7N 127.0E	700MB	2030	987	65 030 20	250 56 030 20	0 3			+25 +26 29	2

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	020000	24.5N 123.4E	35	30	WMO 47912 47910
2	021200	24.3N 124.2E	35	20	WMO 47918
3	021800	24.4N 125.5E	35	20	WMO 47927
4	030900	26.4N 130.2E	35	60	WMO 47945

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM WINONA
BEST TRACK DATA

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
MO/DA/HR	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
071212Z	11.8 132.6	25	11.8 132.1	30.	29.	5.	13.4 127.1	45.	119.	15.	14.9 123.2	55.	76.	5.	16.5 119.2	35.	46.	0.
071218Z	12.2 131.5	25	12.1 130.9	30.	36.	5.	13.7 126.2	45.	105.	10.	15.2 122.2	55.	70.	5.	16.2 118.2	35.	44.	-5.
071300Z	12.8 130.8	25	12.3 130.5	30.	35.	5.	14.0 125.4	45.	70.	5.	15.5 121.6	50.	40.	0.	17.6 117.9	35.	64.	-15.
071306Z	13.5 130.2	30	13.2 129.6	30.	39.	0.	15.0 125.3	45.	30.	-5.	15.8 121.3	50.	6.	5.	17.9 117.8	35.	108.	-20.
071312Z	13.8 129.1	30	14.0 129.4	30.	21.	0.	15.0 125.5	45.	61.	-5.	15.8 121.6	50.	99.	15.	18.3 118.5	35.	281.	-20.
071318Z	13.8 128.0	35	14.1 127.6	30.	29.	-5.	15.4 123.0	50.	29.	0.	17.6 119.1	35.	58.	-5.	20.5 116.3	30.	219.	-15.
071400Z	14.1 126.6	40	13.7 126.8	40.	27.	0.	15.1 122.1	55.	27.	5.	17.8 118.7	30.	109.	-20.	21.6 117.2	30.	339.	-5.
071406Z	14.4 125.5	50	14.4 125.6	45.	6.	-5.	15.8 120.8	40.	29.	-5.	19.0 118.0	35.	171.	-20.	23.0 116.8	30.	390.	0.
071412Z	14.7 124.5	50	14.8 124.5	50.	6.	0.	16.5 120.2	40.	13.	5.	19.7 117.8	30.	226.	-25.	23.0 117.2	30.	460.	5.
071418Z	15.1 123.4	50	15.1 123.2	50.	12.	0.	17.0 119.6	40.	69.	0.	20.4 117.4	30.	281.	-15.	0.0 0.0	0.	-0.	0.
071500Z	15.5 122.3	50	15.3 122.2	50.	13.	0.	18.1 118.5	30.	99.	-20.	22.5 117.2	30.	350.	-5.	0.0 0.0	0.	-0.	0.
071506Z	15.9 121.3	45	15.8 121.2	40.	8.	-5.	18.0 118.1	30.	176.	-25.	23.0 117.3	30.	416.	0.	0.0 0.0	0.	-0.	0.
071512Z	16.4 120.8	35	16.1 120.5	35.	34.	0.	17.8 117.8	30.	257.	-25.	21.3 115.9	30.	375.	5.	0.0 0.0	0.	-0.	0.
071518Z	16.9 118.4	40	16.5 119.2	45.	52.	5.	19.0 115.6	50.	199.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071600Z	17.0 116.8	50	17.6 117.0	45.	17.	-5.	20.2 112.7	60.	92.	25.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071606Z	18.8 115.0	55	18.0 115.2	55.	11.	0.	24.6 109.5	20.	213.	-10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071612Z	19.8 113.8	55	20.0 113.5	55.	21.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071618Z	20.4 112.4	45	20.7 112.1	45.	25.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071700Z	20.8 111.2	35	20.0 110.8	35.	22.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071706Z	21.1 110.1	30	20.8 110.2	30.	19.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
071712Z	21.3 109.2	25	21.3 109.1	30.	6.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	22.	100.	175.	224.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	13.	42.	93.	121.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	10.	10.	9.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	-2.	-4.	-8.	0.	0.	0.	0.
NUMBER OF FORECASTS	21	16	13	9	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1406. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TROPICAL STORM WINONA
FIX POSITIONS FOR CYCLONE NO. 9

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	092100	7.7N 145.1E	PCN 6			PGTW
2	100000	8.0N 143.4E	PCN 6	T1.0/1.0	INIT OBS	PGTW
3	100300	7.2N 142.0E	PCN 6		MID LVL ULCC FIX	PGTW
4	100456	7.1N 142.2E	PCN 5		MID LVL ULCC FIX	PGTW
5	100600	7.0N 143.2E	PCN 6		ULCC FIX	PGTW
6	101600	7.9N 139.4E	PCN 6		ULCC FIX	PGTW
7	110000	11.4N 140.0E	PCN 6	T1.0/1.0	INIT OBS	PGTW
8	110300	11.3N 138.7E	PCN 6			PGTW
9	110444	11.2N 138.0E	PCN 5			PGTW
10	110600	11.4N 137.9E	PCN 6		ULAC FIX	PGTW
11	110900	11.4N 137.1E	PCN 6			PGTW
12	111600	11.5N 136.7E	PCN 6			PGTW
13	111800	11.5N 136.3E	PCN 6			PGTW
14	112100	11.6N 135.7E	PCN 6		BASED ON EXTRAP	PGTW
15	120000	11.4N 135.1E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
16	120300	11.7N 134.0E	PCN 6		BRKS CONTINUITY	PGTW
17	120613	12.0N 133.4E	PCN 5			PGTW
18	120614	12.1N 133.7E	PCN 5	T2.0/2.0	INIT OBS	RPMK
19	120900	12.0N 132.0E	PCN 6			PGTW
20	121200	12.0N 132.1E	PCN 6			PGTW
21	121800	11.9N 131.1E	PCN 6			PGTW
22	122100	12.0N 130.4E	PCN 6			PGTW
23	130000	12.6N 131.7E	PCN 4	T2.5/2.5 /D0.5/24HRS		PGTW
24	130300	13.2N 131.1E	PCN 4			PGTW
25	130601	14.0N 130.4E	PCN 5			PGTW
26	130601	13.9N 129.0E	PCN 5	T2.5/2.5 /D0.5/24HRS		RPMK
* 27	131200	13.3N 127.7E	PCN 6		BRKS CONTINUITY	PGTW
* 28	131600	13.6N 126.9E	PCN 6			PGTW
* 29	131800	13.2N 126.9E	PCN 6		BRKS CONTINUITY	PGTW
30	131846	12.9N 127.4E	PCN 5			PGTW
31	132100	12.8N 127.0E	PCN 6			PGTW
32	140000	13.8N 127.1E	PCN 4	T3.0/3.0-/D0.5/24HRS		PGTW
33	140300	14.6N 126.1E	PCN 4			PGTW
34	140549	14.9N 125.4E	PCN 3			PGTW
35	140549	14.9N 125.5E	PCN 3	T3.0/3.0-/D0.5/24HRS		RPMK
36	141200	14.0N 124.4E	PCN 6		BASED ON EXTRAP	PGTW
37	141600	14.9N 123.0E	PCN 6		BASED ON EXTRAP	PGTW

38	141800	15.1N 123.2E	PCN 6		BASED ON EXTRAP	PGTW
39	141834	15.2N 123.1E	PCN 5		BASED ON EXTRAP	PGTW
40	141834	14.0N 123.1E	PCN 5		BASED ON EXTRAP	RPMK
41	142100	15.1N 122.8E	PCN 6		BASED ON EXTRAP	PGTW
42	150000	15.3N 123.2E	PCN 6	T4.0/4.0-/D1.0/24HRS		PGTW
43	150300	15.1N 122.4E	PCN 6			PGTW
44	150537	15.3N 121.8E	PCN 5	T4.0/4.0-/D1.0/24HRS		RPMK
45	150600	15.5N 121.8E	PCN 6		ULCC FIX	PGTW
46	150719	15.2N 121.6E	PCN 5			RPMK
47	150900	15.4N 121.2E	PCN 6		ULCC FIX	PGTW
48	151200	16.1N 120.4E	PCN 6			PGTW
49	151600	16.5N 119.4E	PCN 6		BASED ON EXTRAP	PGTW
50	151800	16.5N 118.7E	PCN 6			PGTW
51	151822	16.6N 118.4E	PCN 5			PGTW
52	151822	17.1N 118.1E	PCN 5			RPMK
53	152004	16.7N 117.6E	PCN 5			RPMK
54	152100	17.0N 117.4E	PCN 6		BASED ON EXTRAP	PGTW
55	160000	18.0N 116.7E	PCN 4	T2.5/3.0 /W1.5/24HRS		PGTW
56	160300	18.8N 115.8E	PCN 4		EXP LLCC	PGTW
57	160600	19.1N 115.8E	PCN 4		EXP LLCC	PGTW
58	160707	18.9N 114.6E	PCN 3	T2.5/3.0-/D1.5/25HRS		RPMK
59	160707	18.0N 114.2E	PCN 3	T3.0/3.0 /S0.0/26HRS		RODN
60	160900	19.4N 114.0E	PCN 6			PGTW
61	161200	20.0N 114.1E	PCN 6			PGTW
62	161600	20.1N 112.4E	PCN 6			PGTW
63	161952	20.4N 111.6E	PCN 6			RODN
64	162100	20.4N 111.1E	PCN 6			PGTW
65	170000	20.3N 111.0E	PCN 4	T1.0/1.5 /W1.5/24HRS	EXP LLCC	PGTW
66	170300	20.3N 110.9E	PCN 6			PGTW
67	170600	20.8N 110.5E	PCN 4		EXP LLCC	PGTW
68	170655	21.1N 109.9E	PCN 3	T1.5/2.0-/W1.0/24HRS	EXP LLCC	RPMK
69	170900	21.3N 109.0E	PCN 6			PGTW
70	171200	21.9N 109.4E	PCN 6			PGTW
71	171600	21.3N 107.9E	PCN 6			PGTW
72	171940	21.1N 108.8E	PCN 5			RPMK

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	120500	11.5N 133.7E	700MB	3110	1000		040 30 330 60	5 40			+10 + 9 + 9	3
2	130036	12.6N 130.7E	700MB	3071	1001	25 100 60	160 27 120 40	10 10			+10 +10	4
3	130702	13.8N 130.2E	700MB	3071	1000	25 240 110	070 30 270 120					5
4	130850	13.4N 129.9E	1500FT		1000	25 260 90	320 29 260 90	10 30			+24 +23 +21 29	5
5	132106	13.8N 127.4E	1500FT		994	25 120 20	120 49 030 60	6 4				6
6	132233	13.8N 127.1E	1500FT		991	35 020 90	340 50 270 120	3 4			+24 +26 29	6
7	140654	14.6N 125.3E	700MB	2986		65 200 30	099 60 330 30	5 10				7
8	140815	14.5N 125.0E	700MB	2970	986	70 230 15	020 53 260 50	8 8			+12 +17 +10	7
9	152249	17.6N 116.9E	700MB	2980	980	40 090 60	100 40 100 90	4 2			+12 +14 +10	9
10	160110	18.1N 116.6E	700MB	2991		50 100 6	150 52 100 6	4 2				9
11	160639	18.0N 114.0E	700MB	2972	985	55 140 35	200 31 130 65	10 10			+13 +15 +12	10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	142300	15.1N 122.6E	LAND			4		20 DEG SPRL OVRLY STMRY	16.3N 120.6E	98321
2	142340	15.1N 122.9E	LAND					EYE 100 PCT CI DIA 50 KMS	16.3N 120.6E	98321
3	150100	15.1N 122.8E	LAND				1000/ 42904	EYE 100 PCT CI DIA 50 KMS	16.3N 120.6E	98321
4	150230	15.1N 122.4E	LAND				119/3 42706	EYE 100 PCT EL AXIS 90/60 KMS	16.3N 120.6E	98321
5	150600	15.6N 121.5E	LAND				100// 43012	EYE 70 PCT CI OPEN N DIA 35 KMS	16.3N 120.6E	98321
6	150730	15.5N 121.5E	LAND				100// 42012	EYE 80 PCT CI OPEN S DIA 35 KMS	16.3N 120.6E	98321
7	150800	15.5N 121.2E	LAND				100// 42712	EYE 100 PCT CI DIA 20 KMS	16.3N 120.6E	98321
8	150830	15.6N 121.0E	LAND	GOOD	CIRCULAR	10			15.2N 120.6E	98327
9	150900	15.5N 120.9E	LAND				100// 42722	EYE 60 PCT CI DIA 25 KMS	16.3N 120.6E	98321
10	150910	15.7N 120.8E	LAND	FAIR	ELLIPTICAL	10			15.2N 120.6E	98327
11	150935	15.7N 120.8E	LAND	FAIR	ELLIPTICAL			AXIS 20/10	15.2N 120.6E	98327
12	151035	15.9N 120.7E	LAND	POOR	CIRCULAR	10			15.2N 120.6E	98327
13	151200	16.1N 120.2E	LAND				110// 43210	EYE 100 PCT EL AXIS 35/15 KMS	16.3N 120.6E	98321
14	152300	17.0N 116.3E	LAND				10/// 7////		16.3N 120.6E	98321

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ANDY
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
072112Z	11.1	147.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072118Z	11.3	146.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072200Z	11.4	145.6	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072206Z	11.7	144.9	35	11.8	145.0	35.	8.	0.	13.1	142.9	55.	92.	0.	14.6	139.6	65.	183.	0.	15.7	135.7	75.	247.	-15.
072212Z	12.2	144.9	40	12.5	144.3	50.	40.	10.	14.1	141.6	55.	160.	0.	14.7	137.5	65.	256.	0.	14.9	133.4	75.	352.	-15.
072218Z	11.8	145.1	40	12.0	143.8	50.	97.	10.	14.3	140.5	60.	192.	0.	14.8	136.4	65.	285.	-5.	14.9	132.3	75.	321.	-15.
072300Z	11.9	144.5	45	12.1	144.5	45.	12.	0.	12.5	142.1	50.	72.	-15.	14.0	139.3	60.	142.	-20.	14.9	135.1	75.	204.	-15.
072306Z	12.1	144.1	55	12.0	144.0	50.	8.	-5.	12.8	141.4	60.	88.	-5.	14.2	138.1	65.	202.	-25.	15.0	133.3	75.	204.	-20.
072312Z	12.4	143.7	55	11.8	143.8	55.	36.	0.	12.1	142.7	55.	146.	-10.	13.0	139.6	65.	306.	-25.	13.3	135.4	75.	363.	-25.
072318Z	12.8	143.4	60	11.8	143.3	55.	60.	-5.	12.3	142.0	60.	179.	-10.	13.1	138.9	65.	331.	-25.	13.2	134.7	75.	418.	-30.
072400Z	13.2	143.1	65	13.1	142.9	65.	13.	0.	14.8	140.6	75.	72.	-5.	15.7	136.5	85.	181.	-5.	16.2	132.3	90.	253.	-10.
072406Z	13.7	142.6	65	13.7	142.5	65.	6.	0.	15.1	139.8	75.	126.	-15.	15.8	135.7	85.	208.	-10.	16.3	131.6	90.	285.	-10.
072412Z	14.4	141.9	65	14.2	141.9	65.	12.	0.	15.7	138.9	80.	139.	-10.	16.5	134.7	85.	192.	-15.	17.3	130.5	90.	269.	-25.
072418Z	15.2	141.3	70	15.0	141.0	70.	21.	0.	16.2	136.8	85.	120.	-5.	16.9	132.8	90.	178.	-15.	17.5	128.2	95.	229.	-25.
072500Z	16.0	140.6	80	15.9	140.7	80.	8.	0.	18.2	137.2	90.	131.	0.	18.8	132.9	95.	206.	-5.	20.1	128.3	100.	212.	-20.
072506Z	17.2	139.7	90	16.4	140.4	85.	63.	-5.	18.7	137.5	95.	240.	0.	19.3	133.3	110.	295.	10.	19.8	129.1	105.	322.	-15.
072512Z	18.0	138.6	90	18.2	139.3	90.	42.	0.	21.1	135.2	100.	243.	0.	22.2	129.3	110.	180.	-5.	24.3	123.8	115.	164.	0.
072518Z	18.2	136.7	90	18.8	137.7	90.	67.	0.	20.8	132.8	105.	181.	0.	22.7	128.2	110.	192.	-10.	24.5	123.6	115.	164.	10.
072600Z	18.3	134.9	90	18.2	135.2	90.	18.	0.	18.9	129.3	100.	24.	0.	20.0	124.4	105.	49.	-15.	22.9	120.0	90.	33.	-5.
072606Z	18.4	133.3	95	18.8	133.1	95.	27.	0.	19.9	128.2	105.	13.	5.	21.8	123.2	110.	37.	-10.	24.5	118.8	70.	73.	-15.
072612Z	18.4	132.0	100	18.8	131.3	100.	46.	0.	19.8	125.9	110.	61.	-5.	21.2	121.1	110.	91.	-5.	23.2	117.3	80.	127.	10.
072618Z	18.8	130.4	105	18.8	130.7	105.	17.	0.	19.9	125.2	115.	46.	-5.	21.6	120.3	95.	91.	-10.	23.8	116.4	50.	142.	-5.
072700Z	19.3	129.3	100	19.2	128.8	100.	29.	0.	21.2	123.9	100.	46.	-20.	23.6	119.3	85.	85.	-10.	0.0	0.0	0.	-0.	0.
072706Z	19.7	128.1	100	19.6	128.2	100.	8.	0.	21.4	123.4	100.	13.	-20.	23.6	119.4	85.	30.	0.	0.0	0.0	0.	-0.	0.
072712Z	20.2	126.9	115	20.3	126.9	115.	6.	0.	22.9	122.6	110.	66.	-5.	24.9	118.2	50.	62.	-20.	0.0	0.0	0.	-0.	0.
072718Z	20.5	125.7	120	20.8	125.8	120.	19.	0.	23.2	121.4	100.	51.	-5.	24.9	117.0	35.	83.	-20.	0.0	0.0	0.	-0.	0.
072800Z	20.8	124.6	120	21.0	124.5	120.	13.	0.	23.5	120.2	80.	41.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072806Z	21.3	123.6	120	21.4	123.4	120.	13.	0.	23.8	119.1	80.	44.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072812Z	21.8	122.6	115	21.8	122.6	115.	0.	0.	23.5	119.5	70.	56.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072818Z	22.4	121.7	105	22.2	121.9	105.	16.	0.	24.0	119.1	70.	79.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072900Z	23.0	120.7	95	23.0	121.0	95.	17.	0.	25.7	118.0	30.	50.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072906Z	23.8	119.9	85	23.8	120.0	85.	5.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072912Z	24.4	119.2	70	24.4	119.2	70.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072918Z	25.2	118.5	55	25.2	118.6	55.	5.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
073000Z	26.4	117.5	35	26.8	117.1	35.	32.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	24.	99.	160.	231.	24.	99.	160.	231.
AVG RIGHT ANGLE ERROR	14.	50.	106.	144.	14.	50.	106.	144.
AVG INTENSITY MAGNITUDE ERROR	1.	6.	12.	15.	1.	6.	12.	15.
AVG INTENSITY BIAS	0.	-5.	-11.	-13.	0.	-5.	-11.	-13.
NUMBER OF FORECASTS	32	28	23	19	32	28	23	19

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2072. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

TYPHOON ANDY
FIX POSITIONS FOR CYCLONE NO. 10

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	211600	12.2N 144.7E	PCN 6			PGTW
2	211800	12.0N 144.2E	PCN 6		ULCC FIX	PGTW
3	212100	10.8N 145.7E	PCN 6		ULAC FIX	PGTW
* 4	220000	12.6N 145.9E	PCN 6			PGTW
5	220413	11.7N 145.2E	PCN 5	T2.5/2.5	INIT OBS	PGTW
* 6	220600	12.7N 144.3E	PCN 6			PGTW
* 7	220900	11.6N 143.0E	PCN 6		ULCC FIX	PGTW
8	221200	12.1N 144.3E	PCN 6		ULCC FIX	PGTW
* 9	221600	11.8N 143.9E	PCN 6		ULCC FIX	PGTW
* 10	221650	11.5N 143.2E	PCN 5		ULCC FIX	PGTW
* 11	221800	11.5N 142.9E	PCN 6		ULCC FIX	PGTW
* 12	222100	11.1N 142.9E	PCN 6		ULCC FIX	PGTW
13	230000	11.9N 144.6E	PCN 4			PGTW
14	230300	11.6N 145.0E	PCN 6			PGTW
15	230543	11.9N 144.4E	PCN 5	T3.5/3.5 /D1.0/25HRS		PGTW
16	230543	12.1N 144.0E	PCN 5	T4.0/4.0	INIT OBS	RPMK
17	230900	12.8N 144.0E	PCN 6			PGTW
18	231200	12.8N 143.5E	PCN 6		ULCC FIX	PGTW
19	231600	11.7N 143.4E	PCN 6		ULCC FIX	PGTW
20	231645	11.8N 144.1E	PCN 5		ULCC FIX	PGTW
21	231800	11.7N 143.7E	PCN 5		ULCC FIX	PGTW
22	232100	11.7N 143.0E	PCN 6		ULCC FIX	PGTW
23	240000	12.9N 143.0E	PCN 6		ULAC FIX	PGTW
24	240300	13.5N 142.0E	PCN 6		ULCC FIX	PGTW
25	240530	13.0N 142.2E	PCN 5	T4.0/4.0 /D0.5/24HRS		PGTW
26	240600	13.0N 142.1E	PCN 6			PGTW
27	240900	14.1N 141.8E	PCN 6			PGTW
28	241200	14.4N 141.4E	PCN 6		ULCC FIX	PGTW
29	241600	14.6N 140.9E	PCN 6		ULCC FIX	PGTW
30	241800	14.7N 140.2E	PCN 6		ULCC FIX	PGTW
31	242100	15.2N 140.2E	PCN 6		ULCC FIX	PGTW
32	250000	15.9N 140.9E	PCN 6		ULCC FIX BRKS CONTINUITY	PGTW
33	250300	16.3N 140.3E	PCN 6		ULCC FIX	PGTW
34	250510	17.1N 139.9E	PCN 5	T4.5/4.5 /D0.5/24HRS	ULCC FIX	PGTW
35	250600	17.2N 139.0E	PCN 6		ULCC FIX	PGTW
36	250900	17.8N 139.3E	PCN 6		ULCC FIX	PGTW
37	251200	17.9N 138.5E	PCN 6		ULCC FIX	PGTW
38	251600	18.1N 137.1E	PCN 6		ULCC FIX	PGTW
39	251800	18.3N 136.4E	PCN 6			PGTW
40	252100	18.4N 135.6E	PCN 6			PGTW
41	260000	18.5N 135.0E	PCN 6		ULCC FIX	PGTW
42	260300	18.9N 133.7E	PCN 6		ULCC FIX	PGTW
43	260506	18.6N 133.3E	PCN 5	T5.0/5.0-/D0.5/24HRS	ULCC FIX	PGTW
44	260506	18.5N 132.9E	PCN 5	T5.5/5.5	INIT OBS	RPMK
45	260600	18.5N 133.2E	PCN 6		ULCC FIX	PGTW
46	260900	18.6N 132.2E	PCN 6		ULCC FIX	PGTW
47	261200	18.5N 132.0E	PCN 2			PGTW
48	261600	19.0N 131.0E	PCN 2			PGTW
49	261800	18.9N 130.1E	PCN 2			PGTW
50	262100	19.3N 128.9E	PCN 6			PGTW
51	270000	19.4N 129.3E	PCN 6			PGTW
52	270300	19.5N 128.7E	PCN 6			PGTW
53	270600	19.6N 128.0E	PCN 2	T6.0/6.0-/D1.0/25HRS		PGTW
54	270636	19.6N 127.0E	PCN 1	T6.0/6.0 /D0.5/25HRS	EYE DIA 10NM	RPMK
55	270900	20.0N 127.7E	PCN 2			PGTW
56	271600	20.4N 125.9E	PCN 2			PGTW
57	271800	20.4N 125.5E	PCN 6			PGTW
58	271921	20.1N 125.4E	PCN 5			RPMK
59	272100	20.5N 125.0E	PCN 6			PGTW
60	280000	20.5N 124.0E	PCN 6			PGTW
61	280300	21.4N 123.6E	PCN 6			PGTW
62	280624	21.5N 123.6E	PCN 6	T6.0/6.0-/S0.0/24HRS		PGTW
63	280624	21.5N 123.0E	PCN 3	T6.0/6.0-/S0.0/24HRS		RPMK
64	280900	21.5N 122.5E	PCN 6			PGTW
65	281200	21.7N 122.0E	PCN 6			PGTW
66	281600	22.4N 122.1E	PCN 6		ULCC FIX	PGTW
67	281800	22.6N 121.8E	PCN 6		ULCC FIX	PGTW
68	281909	22.6N 121.5E	PCN 3			RPMK
69	282100	22.8N 121.3E	PCN 6		ULCC FIX	PGTW
70	290000	22.6N 120.9E	PCN 6		ULCC FIX	PGTW
71	290300	23.4N 120.1E	PCN 6		ULCC FIX	PGTW
72	290611	23.5N 119.4E	PCN 5	T4.5/4.5-/W1.5/25HRS		PGTW
73	290612	23.9N 119.5E	PCN 5	T4.5/4.5 /W1.5/24HRS		RPMK
74	290900	23.6N 119.4E	PCN 6			PGTW
75	291200	24.5N 119.1E	PCN 6			PGTW
76	291600	24.9N 118.6E	PCN 6			PGTW
77	291800	25.3N 118.4E	PCN 6			PGTW
78	291857	25.7N 118.4E	PCN 5			PGTW
79	292100	25.9N 117.7E	PCN 6			PGTW
80	300000	26.0N 117.4E	PCN 4			PGTW
81	300300	25.2N 117.0E	PCN 6			PGTW
82	300600	26.3N 116.0E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	220223	11.5N 145.2E	700MB	3060	995	60 050 30	270 50 220 40	5 3			+15 + 7	1
2	220538	11.7N 144.9E	700MB	3046		50 160 15	060 40 290 25	5 2			+15 +16 + 8	1
3	221901	11.8N 145.0E	700MB	2992			100 40 350 30	6 6				2
4	222150	11.9N 144.7E	700MB	2990	985	40 360 15	230 33 320 21	6 5			+15 +17 +11	2
5	230700	12.0N 143.9E	700MB	2941		65 120 20	350 33 220 120	10 4				3
6	230943	11.8N 143.0E	700MB	2906	986		220 45 150 110	10 6			+12 +14 +11	3
7	232002	12.5N 143.2E	700MB	3003			230 62 120 40	6 8				4
8	232210	13.1N 143.2E	700MB	2982	986	75 150 60	110 64 340 60	5 5			+14 +18 +12	4
9	240513	13.6N 142.6E	700MB	2930	982	40 050 50	120 58 050 42	5 3			+16 + 8	5
10	240835	13.9N 142.4E	700MB	2941		65 130 75	220 56 120 50	5 3			+12 +10	5
11	242256	15.8N 140.9E	700MB	2879	976	90 060 15	190 80 060 40	5 5	ELLIPTICAL	15 10 040	+10 +15 +11	6
12	252130	18.2N 135.4E	700MB	2836	970	100 360 50	160 81 090 115	10 2			+12 +14 +12	8
13	260023	18.4N 134.0E	700MB	2789		65 290 50	000 77 030 112	10 3			+15 +11	8
14	261216	18.4N 132.0E	700MB	2654	949		160 110 090 40	10 8	CIRCULAR	10	+11 +16 +12	9
15	270011	19.3N 129.3E	700MB	2611	944	100 360 70	100 96 350 60	2 3	CIRCULAR	7	+15 +16 +14	10
16	270921	20.1N 127.4E	700MB	2353	915	110 320 4	060 100 350 90	8 4	CIRCULAR	7	+14 +19 +15	11

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	232135	11.9N 143.2E	LAND	POOR					13.6N 144.9E	91218
2	240445	13.5N 142.7E	LAND	FAIR					13.6N 144.9E	91218
3	240545	13.6N 142.7E	LAND	FAIR					13.6N 144.9E	91218
4	240635	13.8N 142.0E	LAND	FAIR					13.6N 144.9E	91218
5	240735	13.8N 142.6E	LAND	FAIR					13.6N 144.9E	91218
6	280200	21.2N 124.2E	LAND				22015 53219		24.3N 124.2E	47918
7	280300	21.3N 124.0E	LAND				55//4 52714		24.3N 124.2E	47918
8	280400	21.2N 123.6E	LAND				61111 53012		25.1N 121.6E	46696
9	280400	21.2N 123.7E	LAND				20874 52619		24.3N 124.2E	47918
10	280500	21.2N 123.7E	LAND				25/44 50000		24.3N 124.2E	47918
11	280600	21.4N 123.5E	LAND				6//// 53512		25.1N 121.6E	46696
12	280600	21.5N 123.7E	LAND				12674 50122		24.3N 124.2E	47918
13	280700	21.7N 123.4E	LAND				6//// 53216		25.1N 121.6E	46696
14	280700	21.7N 123.3E	LAND				12514 52927		24.3N 124.2E	47918
15	280800	21.5N 122.9E	LAND				10514 73015		24.3N 124.2E	47918
16	280800	21.6N 123.1E	LAND				35//2 52508		25.1N 121.6E	46696
17	280900	21.4N 122.9E	LAND				25544 72615		24.3N 124.2E	47918
18	280900	20.9N 122.2E	LAND				21538 41125		16.3N 120.6E	98321
19	281000	21.7N 122.9E	LAND				65/64 72705		24.3N 124.2E	47918
20	281000	20.7N 122.3E	LAND				21554 41610		16.3N 120.6E	98321
21	281100	21.8N 122.0E	LAND				50584 73406		24.3N 124.2E	47918
22	281300	21.0N 121.0E	LAND				21514 42014	OPEN NW	16.3N 120.6E	98321
23	281300	21.9N 122.6E	LAND				20573 40107		25.1N 121.6E	46696
24	281300	21.9N 122.5E	LAND				10515 53105		24.3N 124.2E	47918
25	281330	21.1N 121.1E	LAND				21424 40409	EYE ELLIPTICAL OPEN N	16.3N 120.6E	98321
26	281400	22.0N 122.4E	LAND				6//// 53110		25.1N 121.6E	46696
27	281400	22.1N 122.3E	LAND				10425 73110		24.3N 124.2E	47918
28	281400	22.0N 122.5E	LAND				2063/ 53100		24.0N 121.6E	46699
29	281500	22.1N 122.1E	LAND				10415 73010		24.3N 124.2E	47918
30	281600	22.2N 122.0E	LAND				6//// 53012		25.1N 121.6E	46696
31	281600	22.2N 122.0E	LAND				10693 53113		24.0N 121.6E	46699
32	281700	22.3N 121.9E	LAND				6//// 53210		25.1N 121.6E	46696
33	281700	22.3N 122.0E	LAND				20413 53407		24.0N 121.6E	46699
34	281740	20.7N 120.0E	LAND				21575 62334	OPEN NNW	16.3N 120.6E	98321
35	281800	22.5N 121.8E	LAND				10415 73211		24.3N 124.2E	47918
36	281830	22.5N 121.7E	LAND				61030 42970		24.0N 121.6E	46699
37	281900	22.6N 121.5E	LAND				20325 73111		24.3N 124.2E	47918
38	282000	22.7N 121.4E	LAND				6///5 73112		24.3N 124.2E	47918

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	282200	22.8N 121.2E	095	010	WMO 46760
2	290100	23.7N 120.6E	085	030	WMO 46751
3	290600	23.8N 119.8E	085	010	
4	290900	24.2N 119.5E	070	025	
5	291500	24.8N 119.0E	065	030	
6	291800	25.0N 118.5E	030	030	
7	292100	26.3N 117.3E	030	030	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON BESS
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
072200Z	11.1	163.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072206Z	11.6	163.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072212Z	12.2	162.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072218Z	12.8	161.6	30	12.7	160.1	30.	88.	0.	14.2	156.6	40.	93.	0.	15.3	152.5	50.	162.	-15.	16.0	148.2	60.	233.	-25.
072300Z	13.2	160.8	30	12.8	160.8	30.	24.	0.	14.8	157.1	45.	54.	0.	16.2	153.2	60.	67.	-10.	17.2	150.2	70.	120.	-20.
072306Z	13.8	159.9	30	13.6	159.8	30.	13.	0.	15.3	156.2	50.	36.	0.	16.8	152.4	65.	53.	-10.	18.0	148.4	80.	236.	-15.
072312Z	14.4	159.0	35	14.4	158.7	30.	17.	-5.	16.3	154.6	50.	58.	-10.	18.0	150.3	65.	155.	-15.	18.8	145.8	80.	372.	-15.
072318Z	15.1	157.9	40	14.9	157.8	35.	13.	-5.	16.8	153.8	50.	63.	-15.	18.2	149.3	65.	192.	-20.	18.9	144.9	80.	414.	-15.
072400Z	15.7	157.0	45	15.8	157.1	45.	0.	0.	18.3	153.2	55.	99.	-15.	20.0	148.2	65.	315.	-25.	20.2	143.3	70.	539.	-25.
072406Z	15.9	156.3	50	16.5	156.0	50.	40.	0.	19.0	151.5	60.	158.	-15.	20.3	146.2	65.	418.	-30.	20.0	140.4	65.	648.	-30.
072412Z	16.3	155.6	60	16.6	155.8	60.	21.	0.	18.4	152.6	70.	96.	-10.	20.2	147.6	75.	352.	-20.	20.2	142.8	75.	511.	-20.
072418Z	16.7	154.9	65	16.8	154.8	65.	8.	0.	18.0	151.6	75.	91.	-10.	19.5	146.4	75.	361.	-20.	19.3	141.8	80.	516.	-15.
072500Z	16.9	154.1	70	16.9	154.0	70.	6.	0.	18.3	150.5	80.	153.	-10.	19.2	145.4	90.	406.	-5.	19.1	141.0	95.	510.	0.
072506Z	17.0	153.3	75	17.1	153.1	75.	13.	0.	18.1	149.5	85.	191.	-10.	19.0	144.6	95.	409.	0.	18.6	140.0	100.	496.	0.
072512Z	16.8	152.7	80	16.9	152.4	80.	18.	0.	18.2	149.9	90.	181.	-5.	20.1	147.8	95.	314.	0.	21.1	144.9	95.	174.	-10.
072518Z	16.6	152.2	85	16.9	152.1	80.	19.	-5.	18.5	150.3	90.	178.	-5.	20.0	148.0	95.	282.	0.	21.0	145.3	95.	73.	-25.
072600Z	16.2	152.0	90	16.4	151.8	90.	17.	0.	16.0	149.5	95.	107.	0.	16.0	146.4	100.	190.	5.	16.1	143.0	110.	285.	-25.
072606Z	15.8	151.8	95	16.2	151.6	90.	27.	-5.	16.0	149.3	100.	86.	5.	16.0	146.2	105.	195.	5.	16.2	143.8	110.	306.	-30.
072612Z	15.5	151.3	95	15.0	151.0	95.	34.	0.	15.0	149.5	105.	47.	10.	15.8	146.2	115.	190.	10.	16.1	142.8	125.	366.	-15.
072618Z	15.7	151.3	95	15.8	151.5	95.	13.	0.	15.8	149.5	105.	29.	10.	15.8	146.2	115.	243.	-5.	16.1	142.8	125.	405.	-10.
072700Z	15.3	151.2	95	15.6	151.3	95.	19.	0.	15.5	149.5	105.	78.	10.	15.4	146.6	115.	332.	-20.	15.7	143.2	125.	486.	-5.
072706Z	15.3	150.6	95	15.5	150.2	95.	26.	0.	15.4	147.3	105.	186.	5.	15.6	144.1	115.	343.	-25.	15.8	140.3	125.	490.	5.
072712Z	15.4	150.2	95	15.3	150.2	95.	6.	0.	15.4	147.3	105.	211.	0.	15.6	144.1	115.	404.	-25.	15.8	140.3	125.	539.	10.
072718Z	15.7	150.0	95	15.9	150.3	95.	21.	0.	15.2	149.4	105.	355.	-15.	15.3	147.4	115.	563.	-20.	15.7	144.2	125.	665.	15.
072800Z	16.8	149.6	95	16.2	150.0	95.	43.	0.	15.7	148.1	110.	355.	-25.	15.7	146.1	115.	565.	-15.	16.0	142.8	125.	643.	20.
072806Z	18.2	148.7	100	17.8	148.4	95.	29.	-5.	19.8	143.8	115.	90.	-25.	21.2	138.8	120.	164.	0.	21.5	133.6	125.	364.	25.
072812Z	18.9	146.9	105	19.2	147.1	95.	21.	-10.	21.4	141.2	105.	96.	-35.	21.6	136.0	115.	249.	0.	27.3	131.2	125.	331.	30.
072818Z	19.8	145.5	120	19.7	145.5	110.	6.	-10.	21.0	139.2	130.	155.	-5.	22.4	134.1	130.	276.	20.	25.2	130.7	120.	377.	30.
072900Z	20.6	144.6	135	20.3	144.5	135.	19.	0.	22.4	139.9	155.	56.	25.	23.8	134.1	130.	236.	25.	25.5	128.9	115.	480.	30.
072906Z	21.3	143.7	140	21.2	143.6	140.	8.	0.	24.2	139.9	145.	42.	25.	26.2	136.2	120.	86.	20.	27.6	133.3	105.	265.	25.
072912Z	22.2	142.7	140	22.3	142.4	140.	18.	0.	25.0	138.8	140.	21.	25.	26.6	135.4	120.	111.	25.	28.3	132.4	100.	364.	30.
072918Z	22.7	141.3	135	22.8	141.2	140.	8.	5.	25.1	137.7	135.	23.	25.	26.7	134.4	115.	158.	25.	28.7	131.9	100.	526.	50.
073000Z	23.3	140.2	130	23.3	140.2	130.	0.	0.	26.0	137.2	110.	42.	5.	28.9	135.5	100.	76.	15.	34.3	135.8	80.	265.	30.
073006Z	23.9	139.2	120	24.0	139.4	125.	13.	5.	26.7	136.7	110.	66.	10.	30.0	135.0	95.	107.	15.	35.8	138.0	70.	278.	30.
073012Z	24.7	139.0	115	24.8	138.9	120.	8.	5.	27.3	136.2	105.	65.	10.	31.3	134.9	90.	144.	20.	0.0	0.0	0.	-0.	0.
073018Z	25.2	138.1	110	25.2	137.9	110.	11.	0.	28.1	135.9	100.	66.	10.	32.5	135.1	85.	249.	35.	0.0	0.0	0.	-0.	0.
073100Z	25.7	137.9	105	25.5	137.8	105.	13.	0.	27.4	136.2	105.	114.	20.	30.8	135.0	90.	478.	40.	0.0	0.0	0.	-0.	0.
073106Z	26.2	137.8	100	26.1	137.4	105.	22.	5.	28.3	136.2	100.	149.	20.	31.8	134.9	85.	493.	45.	0.0	0.0	0.	-0.	0.
073112Z	27.1	137.4	95	27.1	137.7	100.	16.	5.	30.7	135.5	90.	153.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
073118Z	27.8	137.1	90	27.8	137.1	95.	0.	5.	31.5	135.3	85.	302.	35.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080100Z	29.2	136.9	85	29.0	136.8	85.	13.	0.	35.8	137.5	65.	185.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080106Z	30.7	136.9	80	31.0	136.8	80.	19.	0.	39.8	139.8	60.	198.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080112Z	32.9	137.0	70	32.8	136.9	70.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080118Z	36.3	137.1	50	36.1	137.2	60.	13.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080200Z	38.7	136.2	50	38.8	136.7	50.	24.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080206Z	40.0	135.5	40	39.9	135.5	40.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	121.	267.	396.	16.	121.	267.	396.
AVG RIGHT ANGLE ERROR	13.	64.	122.	198.	12.	64.	122.	198.
AVG INTENSITY MAGNITUDE ERROR	2.	13.	17.	20.	2.	13.	17.	20.
AVG INTENSITY BIAS	-0.	2.	1.	1.	-0.	2.	1.	1.
NUMBER OF FORECASTS	43	39	35	31	40	39	35	31

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2811. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

SUPER TYPHOON BESS
FIX POSITIONS FOR CYCLONE NO. 11

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	211600	10.5N 164.0E	PCN 6			PGTW
2	211800	10.9N 164.0E	PCN 6		ULCC FIX	PGTW
3	212100	10.5N 164.1E	PCN 6			PGTW
4	220000	11.1N 163.7E	PCN 6			PGTW
5	220413	11.0N 162.7E	PCN 5	T1.5/1.5	INIT OBS	PGTW
6	220600	12.2N 162.3E	PCN 6			PGTW
* 7	220900	12.9N 160.8E	PCN 6			PGTW
* 8	221200	12.7N 160.6E	PCN 6		ULCC FIX	PGTW
* 9	221600	11.0N 160.9E	PCN 6		ULCC FIX	PGTW
* 10	221650	12.2N 160.2E	PCN 5		ULCC FIX	PGTW
* 11	221800	12.0N 160.3E	PCN 6		ULCC FIX	PGTW
* 12	222100	11.0N 160.4E	PCN 6		ULCC FIX	PGTW
13	230000	13.4N 160.2E	PCN 6			PGTW
14	230401	14.3N 159.8E	PCN 5	T2.5/2.5+/D1.0/24HRS		PGTW
15	230900	13.8N 159.4E	PCN 6			PGTW
16	231600	15.1N 158.2E	PCN 6		ULCC FIX	PGTW
17	231645	15.1N 157.9E	PCN 5			PGTW
18	231800	15.1N 157.6E	PCN 6			PGTW
19	232100	15.3N 157.3E	PCN 6		ULCC F[illegible]	PGTW
20	240000	15.6N 157.2E	PCN 6		ULCC FIX	PGTW
21	240340	16.6N 157.1E	PCN 5	T3.5/3.5 /D1.0/24HRS		PGTW
22	240600	16.7N 156.9E	PCN 6			PGTW
23	240900	16.2N 156.2E	PCN 6		ULCC FIX	PGTW
24	241200	16.7N 155.4E	PCN 6			PGTW
25	241600	16.7N 155.1E	PCN 2		EYE DIA 30NM	PGTW
26	241800	16.0N 154.8E	PCN 4			PGTW
27	242100	16.9N 154.5E	PCN 4			PGTW
28	250000	16.9N 154.1E	PCN 2			PGTW
29	250300	16.9N 153.4E	PCN 2			PGTW
30	250336	16.9N 153.1E	PCN 2	T4.5/4.5 /D1.0/24HRS		PGTW
31	250600	17.0N 153.1E	PCN 2			PGTW
32	250900	16.9N 152.0E	PCN 2			PGTW
33	251200	17.0N 152.7E	PCN 2			PGTW
34	251600	16.9N 152.3E	PCN 2			PGTW
35	251800	16.8N 152.2E	PCN 2			PGTW
36	252100	16.6N 152.0E	PCN 2			PGTW
37	260000	16.4N 151.9E	PCN 2			PGTW
38	260300	16.3N 151.8E	PCN 2			PGTW
39	260506	16.0N 151.7E	PCN 1	T5.5/5.5 /D1.0/25HRS		PGTW
40	260506	15.9N 151.7E	PCN 1	T6.0/6.0	INIT OBS	RPMK
41	260600	15.9N 151.7E	PCN 2			PGTW
42	260900	15.7N 151.7E	PCN 2			PGTW
43	261200	15.7N 151.4E	PCN 2			PGTW
44	261600	15.7N 151.6E	PCN 2			PGTW
45	261800	15.8N 151.5E	PCN 2			PGTW
46	262100	15.7N 151.4E	PCN 2			PGTW
47	270000	15.6N 151.0E	PCN 2			PGTW
48	270300	15.4N 150.6E	PCN 2			PGTW
49	270600	15.4N 150.6E	PCN 2	T6.5/6.5-/D1.0/25HRS		PGTW
50	270900	15.4N 150.5E	PCN 2			PGTW
51	271200	15.4N 150.3E	PCN 2			PGTW
52	271600	15.7N 150.2E	PCN 2			PGTW
53	271739	15.8N 150.4E	PCN 2			PGTW
54	271800	16.0N 150.2E	PCN 2			PGTW
55	272100	16.5N 150.0E	PCN 2			PGTW
56	280000	17.1N 149.7E	PCN 2			PGTW
* 57	280442	18.2N 149.3E	PCN 2	T6.0/6.0-/W0.5/23HRS		PGTW
58	280600	18.3N 148.4E	PCN 2			PGTW
59	280900	19.0N 147.8E	PCN 2			PGTW
60	281200	19.0N 146.9E	PCN 2			PGTW
61	281600	19.3N 146.0E	PCN 2			PGTW
62	281727	19.6N 145.6E	PCN 1			PGTW
63	281800	19.6N 145.6E	PCN 2			PGTW
64	282100	19.8N 145.1E	PCN 2			PGTW
65	290000	20.4N 144.7E	PCN 2			PGTW
66	290300	21.0N 144.0E	PCN 2			PGTW
67	290429	21.2N 143.6E	PCN 1	T6.5/6.5 /D0.5/24HRS		PGTW
68	290600	21.5N 143.4E	PCN 2			PGTW
69	290900	21.9N 143.0E	PCN 2			PGTW
70	291200	22.3N 142.2E	PCN 2			PGTW
71	291600	22.5N 141.5E	PCN 2			PGTW
72	291715	22.5N 141.2E	PCN 1			PGTW
73	291800	22.5N 141.2E	PCN 2			PGTW
74	292100	23.1N 140.8E	PCN 2			PGTW
75	300000	23.3N 140.2E	PCN 2			PGTW

76	300300	23.7N 139.9E	PCN 2			PGTW
77	300407	23.8N 139.6E	PCN 1	T6.0/6.5 /W0.5/24HRS		PGTW
78	300600	23.9N 139.6E	PCN 2			PGTW
79	300900	24.3N 139.3E	PCN 2			PGTW
80	301200	24.8N 138.9E	PCN 2			PGTW
81	301600	25.1N 138.2E	PCN 2			PGTW
82	301703	24.8N 138.1E	PCN 1			PGTW
83	301800	25.1N 138.1E	PCN 2			PGTW
84	301845	25.0N 138.1E	PCN 1			PGTW
85	302100	25.2N 138.0E	PCN 2			PGTW
86	310000	25.5N 138.0E	PCN 2			PGTW
87	310300	25.9N 137.8E	PCN 2			PGTW
88	310540	26.1N 137.7E	PCN 1	T5.5/6.0 /W0.5/25HRS		PGTW
89	310900	26.8N 137.6E	PCN 2			PGTW
90	311200	27.3N 137.5E	PCN 6			PGTW
91	311600	27.6N 137.2E	PCN 6			PGTW
92	311800	27.9N 137.3E	PCN 6			PGTW
93	010000	29.0N 136.9E	PCN 4			PGTW
94	010300	29.9N 136.8E	PCN 4			PGTW
95	010536	30.9N 136.9E	PCN 5	T4.0/5.0-/W1.5/24HRS		PGTW
96	011200	33.1N 137.5E	PCN 6			PGTW
97	011600	34.3N 137.1E	PCN 6			PGTW
98	020000	38.4N 136.6E	PCN 6			PGTW
99	020300	39.2N 135.6E	PCN 6			PGTW
100	020524	39.4N 136.6E	PCN 5	T3.0/3.0	INIT OBS	RKSZ
101	020524	40.2N 134.4E	PCN 6	T4.5/4.5	INIT OBS	RODN

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	222157	13.0N 161.2E	700MB	3090	1001	25 360 15	140 10 170 20	10 10			+12 + 8	1
2	230853	14.2N 159.0E	700MB	3074	998		010 40 200 52	10 3			+12 +14	2
3	232120	15.4N 157.4E	700MB	2970	985	50 100 80	220 57 100 80	8 5			+15 +14 +10	3
4	240039	15.7N 156.0E	700MB	2974		50 100 80	200 54 100 70	8 5				3
5	241909	16.7N 154.7E	700MB	2831	970	70 320 30	300 70 200 50	10 10	CIRCULAR	35	+11 +13 + 8	4
6	250606	17.0N 153.1E	700MB	2768		80 040 30	120 67 040 30	5 4				5
7	250853	16.8N 152.5E	700MB	2769	961		190 72 120 60	10 15	CIRCULAR	40	+12 +17 +10	5
8	252129	16.4N 152.0E	700MB	2711	955	70 300 45	030 91 300 30	6 5	ELLIPTICAL	40 25 090	+13 +19 +10	6
9	260710	15.7N 151.7E	700MB	2670		50 100 5	020 87 300 23	10 3				7
10	260900	15.7N 151.0E	700MB	2661	949		030 86 340 30	10 3	CIRCULAR	30	+14 +20 +15	7
11	261029	15.7N 151.3E	700MB	2661			010 81 270 20	5 5				8
12	262043	15.5N 151.3E	700MB	2679	954	80 360 30	100 87 360 10	10 5	CIRCULAR	30	+15 +17 +14	8
13	270600	15.3N 150.7E	700MB	2640		55 130 60	230 83 140 30	6 5	CIRCULAR	20	+12 +17 +14	9
14	270842	15.2N 150.3E	700MB	2634	948	45 030 105	020 100 320 20	6 3	CONCENTRIC	25 40	+14 +16 +15	9
15	280232	17.6N 149.0E	700MB	2641	948	80 250 40	300 64 250 40	2 4	CIRCULAR	20	+ 9 +16 +10	10
16	281201	18.9N 146.8E	700MB	2534			260 113 140 15	10 8	CIRCULAR	18	+11 +18 +13	11
17	281431	19.2N 146.2E	700MB	2458	927		050 104 360 12	10 5	ELLIPTICAL	15 10 090	+11 +21 +12	11
18	281909	20.0N 145.4E	700MB	2302		55 090 90	170 111 090 20	12 2	CIRCULAR	20	+11 +23 +11	12
19	282202	20.2N 144.8E	700MB	2259	901	90 360 35	070 105 340 20	5 2	CIRCULAR	20	+13 +28 + 6	12
20	290634	21.4N 143.3E	700MB	2257		80 270 12	120 111 020 20	5 2				13
21	290854	21.9N 142.9E	700MB	2260	904	100 360 5	310 53 100 30	5 5	CIRCULAR	7	+12 +27 +12	13
22	292219	23.2N 140.4E	700MB	2311	914	125 100 10	130 101 050 40	10 10	CIRCULAR	20	+12 +16 +16	14
23	301234	24.8N 139.8E	700MB	2518	934		170 79 070 60	5 3	CIRCULAR	30	+14 +15 +15	15
24	302116	25.2N 137.9E	700MB	2562	939		300 80 240 20	6 4	CIRCULAR	30	+14 +16 +16	16
25	310645	26.2N 137.8E	700MB	2610		45 290 25	110 76 350 90	10 2				17
26	310912	26.8N 137.7E	700MB	2645	950	60 090 150	170 82 090 90	10 2	CIRCULAR	20	+13 +17 +16	17
27	311915	28.1N 137.0E	700MB	2724			200 80 130 120	10 4				18
28	312110	28.7N 136.8E	700MB	2719	956	80 290 110	150 72 070 60	5 3			+13 +15 +15	18
29	010733	31.7N 136.8E	700MB	2823			160 69 060 60	10 15				19
30	010906	31.6N 137.0E	700MB	2829	960	45 160 120	080 90 350 90	5 10			+10 +17 +12	19

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	010000	31.6N 136.6E	LAND				5//// /////		35.3N 138.7E	47639
2	011300	33.6N 136.9E	LAND				55/// /////		35.2N 137.0E	47636
3	011300	33.6N 137.0E	LAND				5//// 51522		35.3N 138.7E	47639
4	011300	33.6N 136.7E	LAND				6//// 5////		34.6N 135.7E	47773

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	011500	34.4N 137.1E	060	040	WMO 47663
2	011630	35.1N 137.1E	060	020	WMO 47635
3	011800	36.3N 137.1E	060	040	WMO 47605
4	012100	37.0N 136.9E	050	025	WMO 47601

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPPESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON CECIL
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
080412Z	19.0	130.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080418Z	20.0	127.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080500Z	20.3	127.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080506Z	20.6	126.4	25	20.8	126.6	25.	16.	0.	23.0	123.0	40.	226.	-5.	27.0	121.3	50.	389.	-20.	0.0	0.0	0.	-0.	0.
080512Z	20.7	125.8	25	20.8	126.2	25.	23.	0.	22.7	123.8	40.	140.	-10.	24.4	122.1	40.	218.	-50.	26.5	120.7	[illegible]	287.	-95.
080518Z	21.0	125.2	30	21.2	125.2	30.	12.	0.	23.8	123.3	45.	158.	-10.	24.9	121.8	35.	245.	-75.	26.9	120.3	25.	296.	-100.
080600Z	20.7	124.8	35	21.7	124.6	35.	61.	0.	23.7	122.4	50.	201.	-15.	26.1	120.9	30.	314.	-85.	20.6	119.7	20.	363.	-100.
080606Z	20.1	124.6	45	20.1	124.6	45.	0.	0.	21.4	122.9	55.	54.	-15.	22.6	120.2	45.	181.	-75.	23.1	117.2	30.	373.	-80.
080612Z	20.3	124.4	50	20.6	124.8	50.	29.	0.	22.0	123.2	60.	62.	-30.	22.9	120.8	50.	147.	-70.	23.5	118.4	30.	299.	-75.
080618Z	20.5	124.2	55	20.5	124.3	55.	6.	0.	21.3	123.0	65.	25.	-45.	22.3	120.8	60.	154.	-65.	23.2	118.8	35.	291.	-65.
080700Z	20.7	124.0	65	20.9	123.9	65.	13.	0.	21.5	122.8	75.	34.	-40.	22.5	120.5	55.	198.	-65.	23.5	118.1	35.	311.	-60.
080706Z	20.9	123.7	70	21.0	123.7	70.	6.	0.	21.6	122.5	85.	45.	-35.	22.7	120.2	55.	228.	-55.	23.5	117.7	35.	354.	-55.
080712Z	21.0	123.5	90	20.9	123.8	90.	18.	0.	22.0	123.2	100.	26.	-20.	24.1	121.9	105.	113.	0.	26.2	120.8	60.	147.	-25.
080718Z	21.1	123.4	110	21.0	123.4	95.	6.	-15.	22.0	122.4	100.	81.	-25.	23.7	121.2	105.	170.	5.	25.9	120.3	55.	189.	-20.
080800Z	21.4	123.4	115	21.3	123.2	115.	13.	0.	22.0	122.2	115.	107.	-5.	24.0	121.9	100.	105.	5.	26.2	122.4	80.	108.	10.
080806Z	21.7	123.3	120	21.8	123.2	120.	8.	0.	23.5	122.5	120.	97.	10.	25.5	122.3	105.	89.	15.	27.1	122.9	85.	63.	20.
080812Z	22.4	123.4	120	22.2	123.4	120.	12.	0.	24.5	123.1	115.	53.	10.	26.5	122.8	100.	50.	15.	28.6	123.0	80.	[illegible]	20.
080818Z	22.9	123.5	125	22.9	123.4	120.	6.	-5.	25.2	122.9	110.	42.	10.	27.2	122.6	90.	44.	15.	29.2	122.9	80.	60.	25.
080900Z	23.8	123.8	120	23.9	123.9	120.	8.	0.	28.1	126.2	100.	207.	5.	31.6	124.2	80.	237.	10.	33.8	120.2	70.	323.	20.
080906Z	24.6	123.8	110	24.8	123.7	115.	13.	5.	28.6	125.0	100.	148.	10.	32.6	122.1	80.	285.	15.	35.5	117.6	50.	448.	0.
080912Z	25.3	123.5	105	25.3	123.8	105.	16.	0.	27.0	123.6	90.	39.	5.	30.0	124.7	75.	105.	15.	31.8	126.3	65.	120.	15.
080918Z	25.8	123.3	100	25.8	123.2	95.	5.	-5.	28.2	122.2	75.	80.	0.	30.2	123.3	60.	86.	5.	32.2	125.2	45.	61.	0.
081000Z	26.3	122.9	95	26.4	122.8	90.	8.	-5.	28.6	122.3	75.	83.	5.	30.5	123.4	60.	68.	10.	32.1	125.3	45.	124.	0.
081006Z	26.8	123.1	90	26.8	122.8	85.	16.	-5.	29.2	122.0	65.	81.	0.	31.3	124.2	50.	61.	0.	32.7	126.3	40.	204.	-5.
081012Z	27.2	123.3	85	27.3	123.3	80.	6.	-5.	29.2	124.4	60.	55.	0.	31.1	125.3	45.	62.	-5.	33.4	124.6	30.	159.	-15.
081018Z	27.4	123.4	75	27.7	123.4	75.	18.	0.	29.4	124.6	60.	43.	5.	31.3	125.2	40.	70.	-5.	33.6	124.5	30.	193.	-10.
081100Z	27.7	123.5	70	27.8	123.3	70.	12.	0.	29.9	124.3	55.	29.	5.	31.8	124.2	40.	100.	-5.	33.8	123.5	25.	211.	-15.
081106Z	28.0	123.5	65	28.0	123.2	65.	16.	0.	29.5	123.0	50.	49.	0.	31.4	124.0	35.	204.	-10.	0.0	0.0	0.	-0.	0.
081112Z	28.4	123.9	60	28.3	123.8	60.	8.	0.	29.9	124.8	45.	81.	-5.	31.4	124.7	30.	269.	-15.	0.0	0.0	0.	-0.	0.
081118Z	28.9	124.0	55	28.8	124.2	55.	12.	0.	30.2	125.0	40.	125.	-5.	31.7	124.5	35.	300.	-5.	0.0	0.0	0.	-0.	0.
081200Z	29.5	124.0	50	29.8	124.0	50.	18.	0.	32.1	123.7	35.	85.	-10.	32.8	122.8	25.	270.	-15.	0.0	0.0	0.	-0.	0.
081206Z	30.3	124.0	50	30.2	124.0	50.	6.	0.	32.6	124.1	35.	137.	-10.	34.8	125.2	25.	202.	-15.	0.0	0.0	0.	-0.	0.
081212Z	31.1	124.1	50	31.0	124.1	50.	6.	0.	33.2	124.2	35.	160.	-10.	35.5	124.9	25.	176.	-10.	0.0	0.0	0.	-0.	0.
081218Z	32.1	124.0	45	32.2	124.2	45.	12.	0.	37.7	127.0	30.	213.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081300Z	33.5	123.5	45	33.2	123.8	40.	23.	-5.	38.8	126.7	30.	197.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081306Z	34.7	123.0	45	34.8	123.1	40.	8.	-5.	40.0	126.6	29.	203.	-11.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081312Z	35.6	122.8	45	35.8	122.8	35.	12.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081318Z	36.5	122.8	40	36.8	122.8	35.	18.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081400Z	37.3	123.0	40	37.2	122.7	40.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081406Z	37.8	123.3	40	38.2	123.0	40.	28.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081412Z	38.4	124.3	35	38.5	124.0	35.	15.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081418Z	38.9	125.6	30	38.9	125.4	30.	9.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	14.	102.	172.	219.	14.	102.	172.	219.
AVG RIGHT ANGLE ERROR	9.	41.	75.	141.	9.	41.	75.	141.
AVG INTENSITY MAGNITUDE ERROR	2.	12.	25.	36.	2.	12.	25.	36.
AVG INTENSITY BIAS	-2.	-8.	-18.	-27.	-2.	-8.	-18.	-27.
NUMBER OF FORECASTS	39	33	30	23	35	33	30	23

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1665. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TYPHOON CECIL
FIX POSITIONS FOR CYCLONE NO. 12

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	041744	19.6N 128.7E	PCN 5			PGTW
2	042125	20.0N 127.6E	PCN 6			PGTW
3	050000	20.4N 127.0E	PCN 4			PGTW
4	050600	20.6N 126.5E	PCN 4	T1.5/1.5	INIT OBS	PGTW
5	050900	20.5N 126.4E	PCN 6			PGTW
6	051200	21.0N 125.9E	PCN 6			PGTW
7	051600	21.3N 125.3E	PCN 6			PGTW
8	051800	21.7N 124.9E	PCN 6			PGTW
9	052100	20.5N 124.6E	PCN 6		ULCC FIX	PGTW
10	060000	20.6N 124.2E	PCN 4			PGTW
11	060300	20.7N 123.8E	PCN 4			PGTW
12	060600	20.2N 124.4E	PCN 4	T3.0/3.0+/D1.5/24HRS		PGTW
13	060617	20.0N 124.5E	PCN 1	T3.5/3.5	INIT OBS	RPMK
14	060900	20.3N 124.5E	PCN 4			PGTW
15	061200	20.3N 124.4E	PCN 1			PGTW
16	061600	20.3N 124.3E	PCN 4			PGTW
17	061800	20.6N 124.2E	PCN 2			PGTW
18	061902	20.4N 124.4E	PCN 3			PGTW
19	062100	20.7N 124.0E	PCN 4			PGTW
20	070000	20.7N 124.1E	PCN 4			PGTW
21	070300	20.9N 123.8E	PCN 6			PGTW
22	070605	20.7N 124.0E	PCN 1	T4.5/4.5 /D1.5/24HRS		PGTW
23	070605	20.7N 123.8E	PCN 1	T5.0/5.0+/D1.5/24HRS		RPMK
24	070900	20.9N 123.8E	PCN 2			PGTW
25	071200	20.9N 123.7E	PCN 2			PGTW
26	071600	20.9N 123.5E	PCN 2			PGTW
27	071800	21.1N 123.4E	PCN 2			PGTW
28	071850	21.0N 123.4E	PCN 2			PGTW
29	072100	21.1N 123.4E	PCN 2			PGTW
30	080000	21.3N 123.5E	PCN 2			PGTW
31	080300	21.6N 123.3E	PCN 2			PGTW
32	080553	21.5N 123.5E	PCN 1	T5.5/5.5-/D1.0/24HRS		PGTW
33	080900	22.2N 123.5E	PCN 2			PGTW
34	081200	22.3N 123.5E	PCN 2			PGTW
35	081600	22.7N 123.5E	PCN 2			PGTW
36	081800	22.9N 123.6E	PCN 2			PGTW
37	081830	22.9N 123.5E	PCN 1			PGTW
38	082100	23.3N 123.8E	PCN 2			PGTW
39	090000	23.8N 123.8E	PCN 2			PGTW
40	090300	24.4N 123.6E	PCN 2			PGTW
41	090541	24.7N 123.5E	PCN 1	T6.0/6.0-/D0.5/24HRS		PGTW
42	090900	25.2N 123.7E	PCN 2			PGTW
43	091200	25.5N 123.5E	PCN 2			PGTW
44	091600	25.8N 123.1E	PCN 2			PGTW
45	091800	26.1N 123.1E	PCN 2			PGTW
46	092100	26.2N 123.0E	PCN 2			PGTW
47	100000	26.3N 123.1E	PCN 2			PGTW
48	100300	26.5N 123.1E	PCN 2		EYE DIA 10NM	PGTW
49	100528	26.7N 123.5E	PCN 1	T5.0/5.0	INIT OBS	RODN
50	100529	26.6N 123.2E	PCN 1	T4.5/4.5 /W1.5/23HRS		PGTW
51	100900	27.0N 123.3E	PCN 4			PGTW
52	101200	27.3N 123.2E	PCN 4			PGTW
53	101600	27.3N 123.2E	PCN 4			PGTW
54	101800	27.4N 123.4E	PCN 4			PGTW
55	102100	27.6N 123.2E	PCN 4			PGTW
56	110000	27.7N 123.4E	PCN 4			PGTW
57	110300	27.8N 123.4E	PCN 4		ULCC FIX	PGTW
58	110517	27.8N 123.5E	PCN 1	T3.5/4.0 /W1.0/24HRS		PGTW
59	110900	28.2N 123.9E	PCN 2			PGTW
60	111200	28.5N 124.2E	PCN 4			PGTW
61	111600	28.6N 124.2E	PCN 4			PGTW
62	111800	28.9N 124.1E	PCN 6			PGTW
63	120000	29.7N 123.7E	PCN 6		ULCC FIX	PGTW
·	120300	29.8N 124.0E	PCN 6		ULCC FIX	PGTW
65	120600	30.1N 124.0E	PCN 2	T3.5/3.5-/S0.0/25HRS		PGTW
66	120900	30.7N 124.1E	PCN 2			PGTW
67	121200	31.5N 124.0E	PCN 4			PGTW
68	121600	31.9N 124.2E	PCN 4			PGTW
69	121800	32.1N 123.8E	PCN 6			PGTW
70	122100	32.6N 123.7E	PCN 4			PGTW
71	122100	29.6N 123.7E	PCN 6			PGTW
72	130000	33.5N 123.4E	PCN 4			PGTW
73	130300	33.9N 123.0E	PCN 4			PGTW
74	130600	34.6N 122.9E	PCN 6	T2.5/3.0 /W1.0/24HRS		PGTW
75	130900	35.1N 122.9E	PCN 6			PGTW
76	131200	35.6N 122.8E	PCN 6			PGTW
77	131600	36.1N 122.8E	PCN 6			PGTW
78	131800	36.4N 122.8E	PCN 6			PGTW
79	132100	36.7N 122.9E	PCN 6			PGTW
80	140000	37.3N 123.5E	PCN 6			PGTW
81	140300	37.4N 124.2E	PCN 6		ULCC FIX	PGTW
82	140600	37.7N 123.7E	PCN 6	T2.0/2.5 /W0.5/24HRS	ULCC 37.5N 124.5E	PGTW
83	140900	37.9N 124.0E	PCN 6		ULCC 37.7N 127.1E	PGTW
84	141200	38.4N 125.4E	PCN 6			PGTW
85	141600	38.5N 125.7E	PCN 6			PGTW
86	141800	38.7N 126.1E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIEN-TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	050037	20.3N 126.9E	1500FT		990	25 110 70	200 29 110 70	8 10			+25 +24	1
2	052101	20.4N 124.4E	700MB	3001	994	35 020 90	310 45 230 40	8 10			+10 +11 +11	2
3	060627	20.1N 124.5E	1500FT		986	35 010 30	050 31 300 50	5 3				3
4	060839	20.2N 124.6E	1500FT		985	50 100 15	190 20 110 30	7 2			+25 +25	3
5	062205	20.8N 124.0E	700MB	2859	974	60 360 20	100 60 040 14	10 9	ELLIPTICAL	20 14 140	+10 +14 +11	4
6	070050	20.8N 123.9E	700MB	2823		50 100 30	260 64 100 15	8 5	ELLIPTICAL	23 18 030	+12 +15 +14	4
7	070607	20.8N 123.9E	700MB	2722		80 360 5	020 75 290 20	5 3				5
8	070052	20.9N 123.9E	700MB	2623	945	100 360 7	210 90 100 10	5 1	CIRCULAR	10	+15 +19 +12	5
9	072005	21.2N 123.5E	700MB	2419			000 90 330 13	12 2				6
10	072250	21.3N 123.3E	700MB	2409	924	50 000 90	200 100 100 17	10 2	CONCENTRIC	14 20	+12 +19 +15	6
11	080702	22.0N 123.4E	700MB	2369		100 100 5	290 93 220 16	5 2				7
12	080921	22.1N 123.4E	700MB	2389	920	120 170 15	260 113 170 15	5 2	CIRCULAR	15	+12 +20 +14	7
13	090100	24.0N 123.8E	700MB	2440	925	90 160 13	150 105 080 16	3 5	CONCENTRIC	15 25	+12 +18 +15	8
14	090905	24.9N 123.8C	700MB	2518	935	65 100 5	220 86 160 10	5 2	CIRCULAR	25	+12 +16 +16	9
15	092003	26.1N 123.0E	700MB	2548			210 87 150 30	6 3			+11 +18 +14	10
16	092210	26.2N 122.9E	700MB	2571	940		110 95 050 15	6 3	CIRCULAR	20	+14 +18 +15	10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	072200	21.2N 123.4E	LAND				6//// 53004		25.1N 121.6E	46696
2	080000	21.3N 123.4E	LAND				10714 40000		24.3N 124.2E	47918
3	080030	21.4N 123.6E	LAND				107/3 /////		24.0N 121.6E	46763
4	080130	21.4N 123.7E	LAND				10933 40500		24.0N 121.6E	46699
5	080200	21.5N 123.4E	LAND				///// 53304		25.1N 121.6E	46696
6	080300	21.7N 123.4E	LAND				10714 43314		24.3N 124.2E	47918
7	080530	21.8N 123.5E	LAND				10614 43606		24.0N 121.6E	46699
8	080600	21.8N 123.4E	LAND				10614 40605		24.3N 124.2E	47918
9	080900	22.1N 123.4E	LAND				10514 40000		24.3N 124.2E	47918
10	081000	22.1N 123.4E	LAND				10514 50000		24.3N 124.2E	47918
11	081000	22.1N 123.5E	LAND				10624 43304		24.0N 121.6E	46699
12	081100	22.2N 123.4E	LAND				11614 50205		24.3N 124.2E	47918
13	081130	22.2N 123.5E	LAND				20733 40604		24.0N 121.6E	46699
* 14	081200	22.3N 123.5E	LAND				00614 70304		24.3N 124.2E	47918
15	081230	22.3N 123.6E	LAND				20623 40305		24.0N 121.6E	46699
16	081300	22.4N 123.5E	LAND				11614 70205		24.3N 124.2E	47918
17	081330	22.4N 123.6E	LAND				20711 43408		24.0N 121.6E	46699
18	081400	22.5N 123.6E	LAND				20611 43508		24.0N 121.6E	46699
19	081400	22.4N 123.5E	LAND				11614 70104		24.3N 124.2E	47918
20	081500	22.6N 123.5E	LAND				10614 73606		24.3N 124.2E	47918
21	081600	22.7N 123.5E	LAND				10614 70105		24.3N 124.2E	47918
22	081600	22.5N 123.6E	LAND				12814 50705		24.8N 125.3E	47927
23	081600	22.6N 123.7E	LAND				10823 40200		24.0N 121.6E	46699
24	081700	22.8N 123.6E	LAND				11613 70200		24.3N 124.2E	47918
25	081700	22.7N 123.7E	LAND				23714 53506		24.8N 125.3E	47927
26	081800	22.9N 123.6E	LAND				11613 70206		24.3N 124.2E	47918
27	081800	22.8N 123.7E	LAND				11104 53611		24.8N 125.3E	47927
28	081830	22.9N 123.7E	LAND				10913 40307		24.0N 121.6E	46699
29	081900	23.0N 123.7E	LAND				11613 70308		24.3N 124.2E	47918
30	081900	22.9N 123.7E	LAND				11714 50208		24.8N 125.3E	47927
31	082000	23.1N 123.8E	LAND				11613 70309		24.3N 124.2E	47918
32	082000	23.1N 123.9E	LAND				11614 50414		24.8N 125.3E	47927
33	082100	23.4N 123.8E	LAND				11513 70211		24.3N 124.2E	47918
34	082100	23.3N 123.9E	LAND				11614 53612		24.8N 125.3E	47927
35	082130	23.4N 123.9E	LAND				10912 40112		24.0N 121.6E	46699
36	082200	23.5N 124.0E	LAND				10912 40214		24.0N 121.6E	46699
37	082200	23.5N 123.8E	LAND				12423 71011		24.3N 124.2E	47918
38	082200	23.5N 124.0E	LAND				11614 50212		24.8N 125.3E	47927
39	082300	23.7N 123.8E	LAND				6//// 53414		25.1N 121.6E	46696
40	082300	23.8N 123.8E	LAND				10913 43120		24.0N 121.6E	46699
41	082300	23.7N 123.9E	LAND				11413 70111		24.3N 124.2E	47918
42	082300	23.7N 123.9E	LAND				10514 73612		24.8N 125.3E	47927
43	090000	23.9N 123.8E	LAND				10312 73611		24.3N 124.2E	47918
44	090000	23.8N 123.8E	LAND				10142 53507		24.8N 125.3E	47927
45	090100	24.0N 123.7E	LAND				11412 73409		24.3N 124.2E	47918
46	090100	23.8N 123.8E	LAND				12613 50000		24.8N 125.3E	47927
47	090300	24.2N 123.7E	LAND				11312 73507		24.3N 124.2E	47918
48	090300	24.1N 123.6E	LAND				10514 52901		24.8N 125.3E	47927
49	090500	24.6N 123.7E	LAND				21443 73609		24.3N 124.2E	47918
50	090500	24.5N 123.7E	LAND				10413 53614		24.8N 125.3E	47927
51	090500	24.5N 123.7E	LAND				10932 43313		24.0N 121.6E	46699
52	090500	24.5N 123.7E	LAND				6//// 53610		24.0N 121.6E	46763
53	090530	24.4N 123.7E	LAND				10922 40805		24.0N 121.6E	46699
54	090600	24.6N 123.7E	LAND				21512 73507		24.3N 124.2E	47918
55	090600	24.6N 123.7E	LAND				10954 43611		24.0N 121.6E	46699
56	090600	24.7N 123.7E	LAND				6//// 53507		24.0N 121.6E	46763
57	090630	24.6N 123.8E	LAND				10822 40405		24.0N 121.6E	46699
58	090700	24.7N 123.8E	LAND				11513 70100		24.3N 124.2E	47918
59	090800	24.9N 123.7E	LAND				10912 43414		24.0N 121.6E	46699
60	090800	24.9N 123.6E	LAND				6//// 53207		24.0N 121.6E	46763
61	090800	24.9N 123.8E	LAND				10633 73607		24.3N 124.2E	47918
62	090800	24.9N 123.7E	LAND				10632 53614		24.8N 125.3E	47927
63	090900	25.1N 123.8E	LAND				10033 70109		24.3N 124.2E	47918
64	090900	25.0N 123.7E	LAND				11812 53300		24.8N 125.3E	47927

65	090930	25.1N	123.7E	LAND	10011 40507	24.0N	121.6E	46699
66	091000	25.1N	123.6E	LAND	11012 53500	24.0N	125.3E	[illegible]
67	091000	25.2N	123.7E	LAND	11013 73509	24.3N	124.2E	47918
68	091000	25.2N	123.7E	LAND	10932 43511	24.0N	121.6E	46699
69	091000	25.2N	123.5E	LAND	6//// 53509	24.0N	121.6E	46763
70	091030	25.2N	123.6E	LAND	10022 43116	24.0N	121.6E	46699
71	091100	25.3N	123.6E	LAND	11013 73407	24.3N	124.2E	47918
72	091100	25.2N	123.5E	LAND	11013 53211	24.0N	125.3E	47927
73	091200	25.3N	123.3E	LAND	6//// 53000	25.1N	121.6E	46696
74	091200	25.5N	123.5E	LAND	10023 43111	24.0N	121.6E	46699
75	091200	25.4N	123.5E	LAND	11034 73307	24.3N	124.2E	47918
76	091200	25.3N	123.5E	LAND	11013 53306	24.0N	125.3E	47927
77	091300	25.5N	123.5E	LAND	11014 73300	24.3N	124.2E	47918
78	091400	25.6N	123.4E	LAND	10023 43605	24.0N	121.6E	46699
79	091400	25.6N	123.4E	LAND	21044 73307	24.3N	124.2E	47918
80	091400	25.5N	123.3E	LAND	11013 53211	24.0N	125.3E	47927
81	091500	25.6N	123.4E	LAND	21013 73305	24.3N	124.2E	47918
82	091500	25.6N	123.3E	LAND	10013 53505	24.0N	125.3E	47927
83	091600	25.7N	123.3E	LAND	5//43 73104	24.3N	124.2E	47918
84	091600	25.6N	123.1E	LAND	21063 52911	24.0N	125.3E	47927
85	091630	25.9N	123.1E	LAND	10913 43309	24.0N	121.6E	46699
86	091700	25.9N	123.2E	LAND	6//// 53306	25.1N	121.6E	46696
87	091700	25.9N	123.1E	LAND	10923 40000	24.0N	121.6E	46699
88	091700	25.8N	123.1E	LAND	6///3 73207	24.3N	124.2E	47918
89	091700	25.7N	123.1E	LAND	20044 53611	24.0N	125.3E	47927
90	091700	25.9N	123.1E	LAND	10923 40000	24.0N	121.6E	46763
91	091800	25.9N	123.1E	LAND	6///3 73207	24.3N	124.2E	47918
92	091800	25.9N	123.1E	LAND	10073 53311	24.0N	125.3E	47927

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	060000	28.0N 124.1E	035	040	SHIP OBSERVATION
2	140000	37.5N 123.0E	035	020	WMO 54776
3	141800	38.9N 125.2E	030	040	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON DOT
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
000800Z	7.7	153.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
000806Z	8.1	152.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
000812Z	8.7	151.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
000818Z	9.7	149.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
000900Z	10.4	148.8	30	10.1	149.9	30.	67.	0.	11.8	146.1	40.	306.	-5.	13.8	141.4	65.	351.	0.	15.8	136.7	90.	293.	15.
000906Z	10.9	147.4	35	11.2	147.5	35.	19.	0.	13.0	143.2	50.	220.	0.	14.7	138.7	70.	256.	-10.	15.0	133.8	90.	201.	35.
000912Z	10.8	144.5	40	10.8	144.8	40.	18.	0.	12.2	138.7	55.	40.	0.	13.8	134.0	75.	50.	-5.	15.0	129.5	95.	99.	50.
000918Z	11.6	142.5	45	11.4	142.3	45.	17.	0.	12.8	136.4	65.	12.	5.	14.6	131.8	80.	55.	5.	17.0	127.4	100.	116.	50.
001000Z	12.0	140.9	45	12.0	140.7	45.	12.	0.	13.3	135.0	70.	23.	5.	13.9	130.7	80.	120.	5.	15.4	126.0	100.	240.	50.
001006Z	12.2	139.4	50	12.0	139.0	50.	26.	0.	13.1	133.9	65.	51.	-15.	13.8	129.0	80.	203.	25.	15.9	124.8	95.	277.	40.
001012Z	12.6	138.0	55	12.3	138.3	55.	25.	0.	13.1	133.5	70.	70.	-10.	13.8	128.7	85.	227.	40.	16.2	124.2	100.	279.	40.
001018Z	13.0	136.4	60	12.4	136.9	55.	46.	-5.	13.8	132.2	75.	81.	0.	15.0	128.8	85.	198.	35.	15.4	125.1	100.	336.	40.
001100Z	13.3	135.4	65	13.2	135.0	65.	24.	0.	15.2	130.3	85.	89.	10.	16.4	126.4	95.	184.	45.	16.8	122.8	105.	273.	45.
001106Z	13.8	134.4	80	13.3	134.2	80.	32.	0.	15.3	130.7	100.	84.	45.	16.8	126.9	110.	198.	55.	17.1	123.2	115.	270.	55.
001112Z	14.4	133.4	80	14.2	133.6	80.	17.	0.	16.6	130.3	100.	53.	55.	18.1	127.0	105.	165.	45.	19.2	123.7	110.	180.	50.
001118Z	15.1	132.6	75	14.5	132.6	85.	36.	10.	16.5	129.2	105.	109.	55.	17.6	126.2	110.	219.	50.	18.6	123.4	110.	244.	50.
001200Z	15.8	131.7	75	15.8	131.0	75.	40.	0.	18.2	127.8	85.	72.	35.	20.8	123.8	90.	26.	30.	24.0	121.2	100.	125.	60.
001206Z	16.7	130.8	55	16.8	130.5	75.	45.	20.	18.7	127.2	85.	87.	30.	21.7	124.7	90.	84.	30.	25.2	123.1	100.	263.	65.
001212Z	17.4	129.9	45	17.6	130.0	45.	13.	0.	21.2	127.2	60.	86.	0.	24.2	126.2	70.	256.	10.	27.3	126.1	75.	473.	45.
001218Z	18.3	128.9	50	18.5	129.2	50.	21.	0.	21.8	126.9	60.	127.	0.	24.9	126.1	70.	385.	10.	28.2	126.2	75.	520.	55.
001300Z	19.2	127.7	50	19.2	127.8	50.	6.	0.	23.2	125.2	65.	137.	5.	27.2	124.7	75.	363.	35.	0.0	0.0	0.	-0.	0.
001306Z	20.1	126.8	55	20.2	126.8	55.	6.	0.	24.8	124.8	65.	211.	5.	29.3	124.7	75.	464.	40.	0.0	0.0	0.	-0.	0.
001312Z	20.6	125.8	60	21.0	125.8	60.	24.	0.	24.8	123.5	70.	106.	10.	28.2	122.8	75.	344.	45.	0.0	0.0	0.	-0.	0.
001318Z	21.0	124.8	60	21.7	125.1	60.	45.	0.	24.8	122.8	75.	174.	15.	27.8	121.6	70.	288.	50.	0.0	0.0	0.	-0.	0.
001400Z	21.2	124.0	60	21.2	124.0	60.	0.	0.	22.8	120.8	65.	80.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001406Z	21.6	123.2	60	21.5	123.2	60.	6.	0.	23.2	119.7	50.	70.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001412Z	21.9	122.3	60	21.8	122.5	60.	13.	0.	23.3	119.1	40.	90.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001418Z	22.2	121.4	60	22.0	121.6	60.	16.	0.	24.0	117.8	40.	81.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001500Z	23.4	119.5	40	23.4	119.6	40.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001506Z	23.9	118.5	35	23.8	118.6	35.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001512Z	24.5	117.9	30	24.4	117.7	30.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
001518Z	25.2	117.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	22.	108.	218.	262.	21.	109.	207.	229.
AVG RIGHT ANGLE ERROR	17.	68.	172.	208.	17.	73.	157.	180.
AVG INTENSITY MAGNITUDE ERROR	1.	16.	29.	47.	1.	16.	26.	46.
AVG INTENSITY BIAS	1.	13.	27.	47.	1.	13.	25.	46.
NUMBER OF FORECASTS	27	24	20	16	25	22	18	14

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2435. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TYPHOON DOT
FIX POSITIONS FOR CYCLONE NO. 13

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	071800	7.7N 156.7E	PCN 6			PGTW
2	072100	6.8N 153.5E	PCN 6			PGTW
3	080000	8.0N 153.2E	PCN 4	T1.0/1.0	INIT OBS	PGTW
4	080411	7.0N 152.6E	PCN 3			PGTW
5	080600	8.5N 152.0E	PCN 6		ULCC FIX	PGTW
6	080900	8.0N 151.7E	PCN 6		ULCC FIX	PGTW
* 7	081800	9.1N 148.4E	PCN 6			PGTW
* 8	082100	10.0N 147.6E	PCN 6			PGTW
9	090000	10.3N 149.9E	PCN 4	T2.0/2.0 /D1.0/24HRS		PGTW
10	090300	10.9N 149.3E	PCN 6			PGTW
11	090600	11.4N 147.7E	PCN 6		BASED ON EXTRAP	PGTW
12	090900	11.4N 146.1E	PCN 6		ULCC FIX	PGTW
13	091200	11.9N 144.9E	PCN 6			PGTW
14	091600	11.6N 142.7E	PCN 6			PGTW
15	091644	11.5N 142.9E	PCN 6			PGTW
16	091800	11.6N 142.4E	PCN 6			PGTW
17	092100	11.7N 141.5E	PCN 6			PGTW
18	100000	11.4N 140.7E	PCN 6	T2.5/2.5 /D0.5/24HRS		PGTW
19	100300	11.6N 140.0E	PCN 6		ULCC FIX	PGTW
20	100529	12.0N 139.4E	PCN 5			PGTW
21	100900	12.2N 138.9E	PCN 6			PGTW
22	101200	12.4N 138.0E	PCN 6			PGTW
23	101600	12.5N 136.6E	PCN 6			PGTW
24	1018[illegible]	12.7N 135.0E	PCN 6			PGTW

25	101813	13.0N 136.3E	PCN 5		PGTW
26	102100	13.1N 135.8E	PCN 6		PGTW
27	110000	13.3N 135.6E	PCN 6	T3.5/3.5 /D1.0/24HRS	PGTW
28	110300	13.5N 135.2E	PCN 6		PGTW
29	110517	13.8N 134.5E	PCN 1		PGTW
30	110900	14.1N 133.7E	PCN 4		PGTW
31	111200	14.2N 133.3E	PCN 6		PGTW
32	111600	14.4N 132.6E	PCN 6		PGTW
* 33	111800	14.1N 132.1E	PCN 6		PGTW
34	112100	14.9N 131.2E	PCN 6		PGTW
35	120000	15.2N 131.1E	PCN 6	T4.5/4.5-/D1.0/24HRS	PGTW
36	120300	15.9N 131.2E	PCN 6		PGTW
37	120600	16.7N 131.2E	PCN 6		PGTW
* 38	120647	16.3N 129.6E	PCN 5		RPMK
39	120900	16.0N 131.3E	PCN 6		PGTW
40	121200	17.2N 129.0E	PCN 6		PGTW
41	121600	17.6N 129.4E	PCN 6		PGTW
42	121750	18.8N 128.9E	PCN 5		PGTW
43	122100	18.9N 128.5E	PCN 6		PGTW
44	130000	19.0N 127.7E	PCN 6		PGTW
45	130300	19.6N 127.5E	PCN 6	T3.0/3.5 /W1.5/27HRS	PGTW
46	130600	20.4N 126.8E	PCN 6		PGTW
47	130900	21.0N 126.5E	PCN 6		PGTW
48	131200	21.3N 126.3E	PCN 6		PGTW
49	131600	21.7N 125.5E	PCN 6		PGTW
50	131800	21.8N 125.1E	PCN 6		PGTW
51	132100	21.7N 124.3E	PCN 6		PGTW
52	140000	21.0N 124.0E	PCN 6		PGTW
53	140300	20.9N 123.5E	PCN 6		PGTW
54	140622	21.3N 123.0E	PCN 5	T2.0/3.0 /W1.0/27HRS	PGTW
55	140900	21.2N 122.6E	PCN 6		PGTW
56	141200	21.6N 122.6E	PCN 4		PGTW
57	141600	22.0N 121.7E	PCN 4		PGTW
58	141800	22.1N 121.4E	PCN 4		PGTW
59	141907	22.2N 121.1E	PCN 4		PGTW
60	142100	22.5N 120.4E	PCN 4		PGTW
61	150000	23.1N 119.7E	PCN 6		PGTW
62	150300	24.0N 118.5E	PCN 6		PGTW
63	150610	23.4N 119.1E	PCN 5	T1.0/2.0 /W1.0/24HRS	PGTW
64	150900	24.3N 118.6E	PCN 6		PGTW
65	151200	24.4N 117.7E	PCN 6		PGTW
66	151600	25.0N 116.6E	PCN 6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/	IN/	DP/SST	MSN NO.
* 1	080210	8.4N 153.2E	1500FT		1005	15 020 95	060 38 300 143	5 10			+23	+23	+20	1
2	090118	10.8N 148.5E	1500FT		1003	40 080 50	120 41 100 100	3 8			+23	+21	+21	2
3	090322	10.9N 148.1E	700MB	3084	1003	30 330 50	130 52 030 10	3 4				+13	+ 7	2
4	090715	10.0N 145.9E	700MB	3087		45 040 80	100 44 030 120	6 8						3
5	091022	9.9N 144.8E	700MB	3099	1006		120 41 360 120	10 25			+11	+ 8		3
6	092209	11.9N 141.5E	700MB	3054	998	30 320 30	100 44 320 30	10 20			+12	+12	+ 9	4
7	100653	12.6N 139.3E	700MB	2982	989	60 360 10	210 64 060 55	5 8				+16	+11	5
8	100831	12.5N 138.8E	700MB	2982	987	55 330 15		5 8				+13	+12	5
9	101911	13.1N 136.3E	700MB	2900			330 33 230 10	7 3			+11	+15	+10	6
10	102151	13.0N 135.9E	700MB	2925	979	70 070 15	170 72 090 42	7 2	CIRCULAR	40	+12	+16	+10	6
11	110607	13.7N 134.5E	700MB	2847		90 060 14	090 72 340 27	2 2						7
12	110852	13.9N 134.0E	700MB	2844	971	55 200 11	330 61 280 11	3 2	ELLIPTICAL	10 08 020	+12	+16	+10	7
13	111926	14.0N 131.1E	700MB	2959			170 75 070 25	10 5						8
14	112219	15.5N 132.0E	700MB	2990	986	50 340 60	120 55 360 90	8 10			+13	+17		8
15	120901	17.2N 130.5E	700MB	3025		40 340 60	010 45 280 60	5 10			+12	+15	+ 9	10
16	122019	18.6N 128.2E	700MB	3002		40 100 60	010 44 260 30	10 10						11
17	122202	18.8N 127.8E	700MB	2970		30 020 120	150 40 030 90	5 8			+18	+16	+11	11
18	130950	20.4N 126.1E	700MB	2977	986	75 100 40	120 81 030 45	5 8			+13	+18		12
19	131128	20.5N 125.8E	700MB	2984			080 70 340 40	10 10						12
20	131904	21.2N 124.7E	700MB	2962			110 75 340 20	8 8						13
21	132150	21.2N 124.4E	700MB	2980	986	50 350 20	110 55 350 90	5 8			+14	+18	+ 6	13
22	140710	21.6N 123.0E	700MB	2992		50 080 30	170 46 080 60	5 3						14
23	141010	21.6N 122.8E	700MB	2977		65 010 30	110 48 010 75	5 5			+16	+17	+ 8	14

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	090035	11.6N 145.9E	LAND	FAIR					13.6N 144.9E	91218
2	090935	11.7N 145.2E	LAND	POOR					13.6N 144.9E	91218
3	091235	12.5N 143.8E	LAND	POOR					13.6N 144.9E	91218

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	142210	22.0N 120.2E	040	010	WMO 46745, WMO 46743
2	150000	23.4N 119.6E	040	015	WMO 46730, WMO 46734

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ELLIS
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
081706Z	8.2	154.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081712Z	8.1	153.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081718Z	8.1	152.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081800Z	8.0	151.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081806Z	8.1	150.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081812Z	8.2	148.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081818Z	8.5	147.4	30	8.8	148.2	25.	51.	-5.	9.8	146.2	40.	206.	-5.	10.8	144.3	50.	306.	-20.	12.0	141.5	70.	326.	-25.
081900Z	8.8	146.1	30	9.1	146.1	30.	18.	0.	10.8	143.5	50.	98.	-5.	12.2	140.3	60.	122.	-15.	12.8	136.7	70.	198.	-30.
081906Z	9.4	145.0	30	9.7	144.5	30.	35.	0.	11.2	141.1	50.	54.	-10.	11.9	137.7	65.	150.	-15.	11.9	134.0	75.	313.	-30.
081912Z	10.2	143.9	35	10.2	144.2	35.	18.	0.	11.9	140.9	50.	55.	-15.	13.4	137.4	65.	182.	-20.	14.2	133.9	80.	221.	-35.
081918Z	10.9	142.9	45	10.8	143.2	35.	19.	-10.	12.5	139.8	55.	42.	-15.	13.7	135.8	70.	143.	-25.	14.8	131.7	85.	295.	-35.
082000Z	11.5	142.0	55	11.6	142.0	50.	6.	-5.	13.2	138.1	60.	64.	-15.	14.5	134.2	75.	174.	-25.	15.8	130.2	85.	330.	-40.
082006Z	12.1	141.0	60	12.2	141.2	55.	13.	-5.	14.5	137.4	70.	59.	-10.	15.4	133.8	85.	195.	-20.	16.2	128.5	100.	400.	-25.
082012Z	12.6	140.3	65	12.7	140.4	60.	8.	-5.	14.7	136.8	75.	72.	-10.	15.9	133.8	90.	146.	-25.	17.4	131.2	105.	274.	-15.
082018Z	13.2	139.7	70	13.3	139.4	60.	19.	-10.	15.4	136.2	75.	65.	-20.	16.9	133.2	90.	147.	-30.	18.2	130.6	105.	282.	-10.
082100Z	13.8	139.0	75	13.8	139.0	65.	0.	-10.	15.2	136.5	75.	55.	-25.	16.4	134.3	90.	171.	-35.	17.7	132.5	105.	343.	-10.
082106Z	14.3	138.4	80	14.1	138.3	70.	13.	-10.	15.5	136.1	80.	72.	-25.	16.7	133.9	95.	211.	-30.	17.5	132.1	105.	372.	-5.
082112Z	15.0	138.0	85	14.9	137.7	70.	18.	-15.	17.0	135.2	90.	42.	-25.	18.2	133.0	100.	187.	-20.	19.8	130.0	110.	291.	5.
082118Z	15.6	137.3	95	15.8	137.3	75.	12.	-20.	17.8	134.8	95.	41.	-25.	19.8	132.4	105.	149.	-10.	21.8	130.3	115.	226.	15.
082200Z	16.1	136.7	100	15.8	136.8	95.	19.	-5.	17.2	135.1	125.	121.	0.	18.8	133.3	130.	247.	15.	20.7	131.2	135.	324.	35.
082206Z	16.7	136.1	105	16.8	136.1	110.	6.	5.	18.9	134.1	135.	79.	10.	20.6	132.2	140.	186.	30.	22.7	131.8	135.	240.	40.
082212Z	17.4	135.8	115	17.4	135.8	120.	0.	5.	20.1	134.2	135.	60.	15.	21.9	132.5	140.	150.	35.	24.1	131.3	130.	203.	40.
082218Z	18.3	135.3	120	18.2	135.4	125.	8.	5.	20.9	134.1	140.	82.	25.	22.8	132.7	135.	158.	35.	25.2	132.0	130.	190.	40.
082300Z	19.2	134.9	125	19.2	135.1	125.	11.	0.	21.7	133.6	135.	82.	20.	23.8	132.2	130.	140.	30.	25.9	131.1	120.	176.	35.
082306Z	20.2	134.3	125	20.2	134.4	125.	6.	0.	22.7	132.8	130.	64.	20.	25.2	131.5	125.	98.	30.	27.5	130.6	115.	132.	35.
082312Z	21.2	133.9	120	21.2	134.1	120.	11.	0.	24.5	132.2	120.	5.	15.	27.0	130.9	120.	32.	30.	29.2	130.1	120.	107.	45.
082318Z	22.1	133.4	115	22.1	133.4	120.	0.	5.	25.3	131.8	120.	0.	20.	27.9	130.6	120.	12.	30.	30.2	129.5	120.	156.	55.
082400Z	22.9	132.9	115	23.0	132.9	120.	6.	5.	26.7	131.0	100.	30.	0.	32.4	130.8	75.	218.	-10.	39.8	133.6	40.	379.	-20.
082406Z	23.7	132.4	110	23.7	132.4	115.	0.	5.	27.3	130.4	95.	42.	0.	34.1	130.8	65.	264.	-15.	0.0	0.0	0.	-0.	0.
082412Z	24.5	132.1	105	24.4	132.1	105.	6.	0.	28.1	130.4	95.	42.	5.	34.4	130.8	65.	223.	-10.	0.0	0.0	0.	-0.	0.
082418Z	25.3	131.8	100	25.4	131.7	100.	8.	0.	29.2	130.2	90.	69.	0.	35.5	131.2	55.	218.	-10.	0.0	0.0	0.	-0.	0.
082500Z	26.1	131.2	100	26.2	130.9	95.	17.	-5.	31.2	129.4	65.	157.	-20.	38.2	132.3	40.	276.	-20.	0.0	0.0	0.	-0.	0.
082506Z	26.7	130.8	95	27.0	130.8	90.	18.	-5.	32.8	129.6	65.	151.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082512Z	27.4	130.5	90	27.3	130.4	85.	8.	-5.	31.5	129.7	60.	91.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082518Z	28.1	130.6	90	28.2	130.4	80.	12.	-10.	31.4	129.8	55.	106.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082600Z	28.8	130.6	85	28.9	130.5	80.	8.	-5.	33.2	130.4	50.	88.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082606Z	29.7	130.8	80	29.8	130.6	75.	12.	-5.	35.1	130.2	45.	95.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082612Z	30.7	131.2	75	30.7	131.1	70.	5.	-5.	36.3	131.0	45.	139.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082618Z	31.9	131.8	65	31.8	131.8	65.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082700Z	33.6	132.1	60	32.7	132.0	60.	54.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082706Z	35.7	132.0	45	35.1	132.0	50.	36.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082712Z	38.5	131.9	40	38.7	131.8	40.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	14.	76.	171.	263.	12.	76.	171.	263.
AVG RIGHT ANGLE ERROR	8.	42.	81.	153.	8.	42.	81.	153.
AVG INTENSITY MAGNITUDE ERROR	5.	13.	23.	28.	5.	13.	23.	28.
AVG INTENSITY BIAS	-3.	-4.	-5.	3.	-3.	-4.	-5.	3.
NUMBER OF FORECASTS	36	32	26	22	33	32	26	22

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2640. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TYPHOON ELLIS
FIX POSITIONS FOR CYCLONE NO. 14

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	170404	9.1N 154.0E	PCN 5	T1.0/1.0		PGTW
2	171600	7.7N 152.0E	PCN 6			PGTW
3	171649	7.5N 152.7E	PCN 5			PGTW
4	172100	7.1N 151.7E	PCN 6			PGTW
5	180000	7.5N 151.6E	PCN 6		BASED ON EXTRAP	PGTW
6	180300	8.0N 150.9E	PCN 6	T1.5/1.5 /D0.5/23HRS	BASED ON EXTRAP	PGTW
7	180600	8.1N 150.2E	PCN 6			PGTW
8	180900	8.1N 149.5E	PCN 6		ULCC FIX	PGTW
9	181200	8.6N 148.4E	PCN 6			PGTW
10	181600	8.3N 148.1E	PCN 6			PGTW
11	181637	8.2N 148.1E	PCN 5			PGTW
12	181800	8.2N 148.0E	PCN 6			PGTW
13	182100	8.2N 147.6E	PCN 6			PGTW
14	190000	9.4N 145.4E	PCN 6			PGTW
15	190300	9.4N 144.9E	PCN 6	T2.0/2.0 /D0.5/24HRS		PGTW
16	190522	9.5N 144.4E	PCN 5			PGTW
17	190600	9.5N 144.3E	PCN 6			PGTW
18	190900	10.0N 144.2E	PCN 6			PGTW
19	191200	10.5N 144.1E	PCN 6			PGTW
20	191600	10.6N 143.1E	PCN 6			PGTW
21	191800	10.6N 142.7E	PCN 6			PGTW
22	192100	11.6N 142.2E	PCN 6			PGTW
23	200000	11.5N 142.4E	PCN 6			PGTW
24	200300	11.9N 141.7E	PCN 6	T3.5/3.5 /D1.5/24HRS		PGTW
25	200510	12.2N 141.1E	PCN 5			PGTW
26	200600	12.3N 140.9E	PCN 2			PGTW
27	200900	12.5N 140.7E	PCN 6			PGTW
28	201200	12.8N 140.2E	PCN 6			PGTW
29	201600	13.3N 139.8E	PCN 6			PGTW
30	201800	13.3N 139.2E	PCN 6			PGTW
31	202100	13.7N 139.3E	PCN 6			PGTW
32	210000	13.9N 139.0E	PCN 2			PGTW
33	210300	13.9N 138.7E	PCN 4	T4.5/4.5 /D1.0/24HRS		PGTW
34	210450	14.0N 138.5E	PCN 3			PGTW
35	210600	14.4N 138.6E	PCN 4			PGTW
36	210900	15.0N 138.1E	PCN 2			PGTW
37	211200	15.2N 137.9E	PCN 2		EYE DIA 20NM	PGTW
38	211600	15.6N 137.6E	PCN 2			PGTW
39	211743	15.8N 137.3E	PCN 1			PGTW
40	212100	15.8N 137.0E	PCN 2			PGTW
41	220000	16.0N 136.6E	PCN 2			PGTW
42	220300	16.6N 136.4E	PCN 2	T5.5/5.5 /D1.0/24HRS		PGTW
43	220445	16.5N 136.2E	PCN 1			PGTW
44	220900	17.2N 136.0E	PCN 2			PGTW
45	221200	17.5N 135.8E	PCN 2			PGTW
46	221600	18.0N 135.6E	PCN 2		EYE DIA 30NM	PGTW
47	221730	18.3N 135.4E	PCN 1		EYE DIA 40NM	PGTW
48	222100	18.8N 135.2E	PCN 2		EYE DIA 35NM	PGTW
49	230000	19.2N 135.0E	PCN 2	T6.5/6.5 /D1.0/21HRS		PGTW
50	230300	19.7N 134.7E	PCN 2			PGTW
51	230615	20.3N 134.5E	PCN 1			PGTW
52	230900	20.8N 134.4E	PCN 2			PGTW
53	231200	21.3N 134.1E	PCN 2			PGTW
54	231600	21.8N 133.6E	PCN 2			PGTW
55	231800	22.3N 133.3E	PCN 2			PGTW
56	231900	22.2N 133.4E	PCN 1			PGTW
57	231900	22.2N 133.5E	PCN 1			RPMK
58	232100	22.6N 133.0E	PCN 2			PGTW
59	240000	23.0N 132.8E	PCN 2	T6.0/6.5 /W0.5/24HRS		PGTW

60	240300	23.2N 132.6E	PCN 2			PGTW
61	240603	23.7N 132.5E	PCN 1			PGTW
62	240900	24.2N 132.2E	PCN 2			PGTW
63	241200	24.6N 132.2E	PCN 2			PGTW
64	241600	25.2N 131.9E	PCN 2			PGTW
65	241800	25.5N 131.9E	PCN 2			PGTW
66	241848	25.3N 132.0E	PCN 1			RPMK
67	250000	26.2N 131.1E	PCN 2	T5.0/5.5 /W1.0/24HRS	EYE DIA 10NM	PGTW
68	250300	26.6N 131.0E	PCN 4		ULCC FIX	PGTW
69	250551	26.9N 130.9E	PCN 1			PGTW
70	250900	27.5N 130.7E	PCN 4			PGTW
71	251200	27.6N 130.4E	PCN 4			PGTW
72	251600	27.9N 130.6E	PCN 4			PGTW
73	251836	28.1N 130.7E	PCN 3			PGTW
74	252100	28.5N 130.8E	PCN 4			PGTW
75	260000	28.8N 130.5E	PCN 4	T4.0/4.5 /W1.0/24HRS		PGTW
76	260300	29.3N 130.6E	PCN 4			PGTW
77	260539	29.9N 131.1E	PCN 3			PGTW
78	260900	30.3N 130.9E	PCN 2			PGTW
79	261200	30.7N 131.2E	PCN 4			PGTW
80	261600	31.5N 131.5E	PCN 4			PGTW
81	261824	31.8N 131.5E	PCN 3			PGTW
82	262100	32.5N 132.3E	PCN 6			PGTW
83	270000	33.0N 131.9E	PCN 6	T3.0/3.5 /W1.0/24HRS		PGTW
84	270300	34.9N 132.0E	PCN 6			PGTW
85	270600	36.5N 132.4E	PCN 6			PGTW
* 86	270900	27.9N 132.4E	PCN 6			PGTW
87	271200	38.4N 131.8E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	180402	8.3N 150.6E	1500FT		1003	20 150 60		15 15			+23 +23	1
2	191100	10.2N 144.4E	700MB	3055	1002		090 53 050 60	10 8			+11 +10 +10	3
3	191052	11.1N 142.8E	700MB	2970			030 49 300 40	10 5				4
4	192124	11.2N 142.4E	700MB	2965	987	65 050 30	130 74 050 40	8 3			+10 +14	4
5	200600	12.2N 141.2E	700MB	2935		55 080 14	120 63 030 49	6 4				5
6	200850	12.2N 140.8E	700MB	2925	981	30 240 20	060 66 150 30	6 5			+14 +15 +10	5
7	201950	13.3N 139.4E	700MB	2076				10 12				6
8	202053	13.3N 139.3E	700MB	2847	971	55 080 74	160 56 070 60	10 10			+12 +15	6
9	210722	14.5N 138.2E	700MB	2794	965	68 080 30	060 84 320 43	8 1				7
10	210903	14.6N 138.0E	700MB	2757		50 330 90	270 67 170 60	8 2	CIRCULAR	30	+14 +17 +10	7
11	211001	15.8N 137.1E	700MB	2689			170 91 100 30	10 08				8
12	212050	15.8N 136.9E	700MB	2659	950	100 090 20	330 98 250 30	10 8	CIRCULAR	40	+12 +16	8
13	220606	16.7N 136.2E	700MB	2491		75 360 100	200 105 120	7 3	ELLIPTICAL	40 30 090	+12 +22 + 8	10
14	220859	17.0N 136.0E	700MB	2445	926		270 97 180 20	6 5	CIRCULAR	38	+13 +21 + 7	10
15	222153	18.0N 135.2E	700MB	2331		75 300 8	150 101 020 22	3 2	CIRCULAR	30	+10 +25 + 5	11
16	230112	19.5N 134.0E	700MB	2366		115 310 15	310 112 210 20	3 1	CIRCULAR	30	+17 +24 + 8	11
17	230612	20.3N 134.3E	700MB	2301	920	100 270 15	210 112 130 30	5 2			+22 +15	12
18	230845	20.8N 134.3E	700MB	2901		120 210 20	260 105 260 15	5 5	CIRCULAR	30	+15 +21 +13	12
19	240700	23.0N 132.2E	700MB	2536			210 81 130 30	5 5				14
20	240835	24.0N 132.2E	700MB	2530	937		290 85 220 25	5 5	CIRCULAR	40	+14 +15 +15	14
21	242211	25.0N 131.1E	700MB	2631		65 250 10	240 84 140 71	1 5			+17 +20 +15	15
22	250040	27.1N 130.5E	700MB	2615	946	65 130 120	220 78 130 100	8 15	CIRCULAR	30	+15 +15	16
23	252151	28.7N 130.6E	700MB	2690			120 78 040 90	2 5	CIRCULAR	30	+17 +18 +15	17
24	260033	30.0N 130.8E	700MB	2680		50 090 160	100 68 090 100	8 3			+17 +18	18

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	242300	26.1N 131.1E	LAND				35/04 5////		26.1N 127.7E	47937
2	250000	26.2N 131.0E	LAND				35//3 53200		26.1N 127.7E	47937
3	250100	26.3N 131.1E	LAND				249/4 43300		28.4N 129.5E	47909
4	250100	26.3N 131.1E	LAND				25//5 50200		26.1N 127.7E	47937
5	250200	26.4N 131.1E	LAND				249/4 53311		28.4N 129.5E	47909
6	250200	26.4N 131.1E	LAND				65/45 73606		26.1N 127.7E	47937
7	250300	26.5N 131.0E	LAND				22914 53400		28.4N 129.5E	47909
8	250300	26.5N 130.9E	LAND				20913 73406		26.1N 127.7E	47937
9	250400	26.7N 131.0E	LAND				24914 53611		28.4N 129.5E	47909
10	250400	26.7N 130.9E	LAND				55914 73507		26.1N 127.7E	47937
11	250500	26.9N 131.0E	LAND				24914 53613		28.4N 129.5E	47909
12	250500	26.9N 130.8E	LAND				65//7 73311		26.1N 127.7E	47937
13	250600	27.0N 130.8E	LAND				22973 53113		28.4N 129.5E	47909
14	250600	26.9N 130.8E	LAND				20972 73509		26.1N 127.7E	47937
15	250700	27.1N 130.7E	LAND				22913 53000		28.4N 129.5E	47909
16	250700	27.3N 130.8E	LAND				20913 73411		26.1N 127.7E	47937
17	251000	27.2N 130.4E	LAND				22913 53105		28.4N 129.5E	47909
18	251000	27.2N 130.5E	LAND				21913 72603		26.1N 127.7E	47937
19	251200	27.2N 130.5E	LAND				22913 50000		28.4N 129.5E	47909
20	251200	27.2N 130.4E	LAND				2///3 72603		26.1N 127.7E	47937
21	251300	27.3N 130.4E	LAND				22913 53000		28.4N 129.5E	47909
22	251300	27.3N 130.5E	LAND				35913 50507		26.1N 127.7E	47937
23	251400	27.4N 130.5E	LAND				22913 50500		28.4N 129.5E	47909
24	251400	27.4N 130.5E	LAND				35//3 53400		26.1N 127.7E	47937
25	251500	27.5N 130.6E	LAND				22913 50500		28.4N 129.5E	47909
26	251500	27.5N 130.6E	LAND				35//3 70306		26.1N 127.7E	47937
27	251600	27.7N 130.6E	LAND				22913 53613		28.4N 129.5E	47909
28	251600	27.8N 130.6E	LAND				5///3 53619		26.1N 127.7E	47937
29	251700	27.9N 130.6E	LAND				22913 53613		28.4N 129.5E	47909
30	251800	28.1N 130.5E	LAND				22913 53313		26.1N 127.7E	47909
31	251900	28.2N 130.5E	LAND				22813 53411		26.1N 127.7E	47909
32	260000	28.9N 130.6E	LAND				54912 53500		30.6N 131.0E	47869
33	260000	28.9N 130.6E	LAND				2291/ 53200		26.1N 127.7E	47909
34	261100	30.4N 131.1E	LAND				20542 60411		33.4N 130.3E	47806
35	261100	30.4N 131.1E	LAND				10472 50416		30.6N 131.0E	47869
36	261300	30.7N 131.2E	LAND				20512 60111		33.4N 130.3E	47806
37	261300	30.7N 131.3E	LAND				11432 50200		30.6N 131.0E	47869
38	261355	30.9N 131.3E	LAND	FAIR		30			32.1N 131.5E	47854
39	261400	31.0N 131.3E	LAND				12612 50116		30.6N 131.0E	47869
40	261400	30.9N 131.3E	LAND				20512 60312		33.4N 130.3E	47806
41	261500	31.2N 131.4E	LAND				10512 50216		30.6N 131.0E	47869
42	261500	31.2N 131.3E	LAND				20772 60125		33.4N 130.3E	47806
43	261555	31.3N 131.3E	LAND	GOOD		30		MOVG 3525	32.1N 131.5E	47854
44	261600	31.4N 131.3E	LAND				10573 63616		33.4N 130.3E	47806
45	261600	31.5N 131.4E	LAND				11512 50116		30.6N 131.0E	47869
46	261655	31.6N 131.3E	LAND	GOOD		20		MOVG 3620	32.1N 131.5E	47854
47	261700	31.6N 131.4E	LAND				10422 53611		30.6N 131.0E	47869
48	261700	31.7N 131.3E	LAND				10573 63616		33.4N 130.3E	47806
49	261755	31.8N 131.5E	LAND	POOR		5		MOVG 0330	32.1N 131.5E	47854
50	261800	31.9N 131.5E	LAND				255/2 5////		34.3N 132.6E	47792
51	261800	31.9N 131.5E	LAND				10423 60213		33.4N 130.3E	47806
52	261800	31.8N 131.6E	LAND				54542 50216		30.6N 131.0E	47869
53	261800	31.9N 131.4E	LAND				2//// /////		33.3N 134.2E	47869
54	261855	32.0N 131.7E	LAND	FAIR		8		MOVG 0325	32.1N 131.5E	47854
55	261900	32.1N 131.7E	LAND				21443 60316		33.4N 130.3E	47806
56	261900	32.1N 131.8E	LAND				10312 50316		30.6N 131.0E	47869
57	261900	32.1N 131.5E	LAND				5//// 50214		33.3N 134.2E	47899
58	261900	32.1N 131.6E	LAND				25512 50111		34.3N 132.6E	47792
59	261955	32.3N 131.8E	LAND	FAIR		10		MOVG 0135	32.1N 131.5E	4785.
60	270600	35.7N 132.0E	LAND				55//2 53627		35.5N 133.1E	47791
61	270700	36.2N 131.8E	LAND				65//3 53430		35.5N 133.1E	47791
62	270800	36.5N 131.8E	LAND				65//2 53622		35.5N 133.1E	47791
63	270900	37.1N 131.8E	LAND				65//2 53632		35.5N 133.1E	47791
64	271000	37.5N 131.8E	LAND				65//2 53630		35.5N 133.1E	47791

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	261800	31.8N 131.6E	060	020	WMO 47835
2	262100	32.4N 132.0E	060	040	WMO 47815
3	270300	34.2N 132.0E	020	050	WMO 47755

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON FAYE
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
082000Z	11.3	124.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082006Z	11.7	123.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082012Z	11.9	122.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082018Z	12.1	121.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082100Z	12.1	121.0	30	12.2	120.2	25.	47.	-5.	12.5	117.4	30.	132.	-15.	13.3	114.2	35.	272.	-40.	15.0	111.6	35.	458.	-50.
082106Z	12.2	120.3	35	12.0	119.2	25.	66.	-10.	12.2	115.7	30.	223.	-25.	13.6	111.8	35.	408.	-45.	15.8	108.2	30.	669.	-60.
082112Z	12.3	119.7	35	12.7	118.9	30.	53.	-5.	13.1	115.7	40.	215.	-25.	13.8	112.1	45.	390.	-40.	15.4	108.5	35.	649.	-50.
082118Z	12.0	119.3	40	12.6	118.4	30.	64.	-10.	12.8	115.8	40.	194.	-30.	13.3	112.8	45.	363.	-40.	14.3	109.5	35.	684.	-40.
082200Z	12.0	119.6	45	12.3	118.6	30.	61.	-15.	12.5	116.4	40.	141.	-35.	12.6	113.5	50.	342.	-35.	13.2	110.3	35.	621.	-30.
082206Z	12.2	119.5	55	12.3	119.3	35.	13.	-20.	12.8	118.1	45.	37.	-35.	13.3	115.3	55.	255.	-35.	14.0	112.2	50.	505.	-5.
082212Z	12.4	119.3	65	12.4	119.2	55.	6.	-10.	13.2	117.6	70.	69.	-15.	13.3	114.8	75.	303.	-10.	14.1	111.6	75.	560.	25.
082218Z	12.5	119.1	70	12.6	119.0	60.	8.	-10.	13.2	117.1	75.	113.	-10.	13.3	114.6	75.	340.	0.	13.9	112.2	70.	566.	20.
082300Z	12.6	118.8	75	12.7	118.7	70.	8.	-5.	13.3	116.2	75.	181.	-10.	14.2	113.1	70.	448.	5.	15.1	109.8	55.	672.	10.
082306Z	12.6	118.7	80	12.8	118.4	70.	21.	-10.	13.8	116.8	75.	164.	-15.	14.9	114.2	70.	378.	15.	15.9	111.8	60.	646.	20.
082312Z	12.8	118.7	85	12.8	118.8	80.	6.	-5.	13.2	117.2	75.	181.	-10.	13.9	114.9	70.	420.	20.	15.0	112.2	65.	666.	25.
082318Z	12.9	119.0	85	12.8	118.8	80.	13.	-5.	13.3	117.4	75.	209.	0.	14.2	115.1	70.	420.	20.	15.5	112.5	65.	692.	30.
082400Z	13.4	119.3	85	13.3	119.5	80.	13.	-5.	14.9	119.8	90.	140.	25.	16.1	117.6	100.	272.	55.	16.5	114.9	115.	606.	85.
082406Z	14.1	119.6	90	14.1	119.6	80.	0.	-10.	16.8	117.8	95.	142.	40.	18.2	114.8	105.	391.	65.	18.6	111.6	115.	786.	90.
082412Z	15.0	119.7	85	14.8	119.8	80.	13.	-5.	17.[illegible]	119.0	80.	131.	30.	18.7	116.7	85.	329.	45.	19.9	114.2	85.	682.	55.
082418Z	15.9	119.8	75	15.9	119.8	80.	0.	5.	18.8	118.9	80.	82.	30.	19.9	116.2	80.	388.	45.	20.4	112.3	80.	856.	50.
082500Z	17.2	120.2	65	17.1	120.2	80.	6.	15.	20.2	119.1	75.	84.	30.	20.7	115.8	75.	463.	45.	20.6	111.5	75.	999.	40.
082506Z	18.2	119.8	55	18.2	120.2	80.	23.	25.	20.5	118.5	70.	158.	30.	21.8	116.3	60.	485.	35.	22.5	113.7	50.	936.	0.
082512Z	19.0	119.9	50	18.8	119.7	50.	17.	0.	21.6	118.0	60.	219.	20.	23.2	116.0	40.	553.	10.	0.0	0.0	0.	-0.	0.
082518Z	19.4	120.2	50	19.5	120.0	55.	13.	5.	22.1	120.0	60	166.	25.	24.5	120.2	40.	405.	10.	27.5	121.7	25.	585.	-45.
082600Z	19.7	120.5	45	19.8	120.4	55.	8.	10.	22.5	123.1	60.	65.	30.	24.4	126.3	65.	168.	30.	27.2	129.0	70.	249.	0.
082606Z	20.4	121.3	40	20.6	121.3	55.	12.	15.	22.5	124.4	60.	34.	35.	24.8	126.9	70.	206.	20.	27.6	129.2	75.	254.	5.
082612Z	21.2	121.9	40	21.1	122.1	40.	13.	0.	23.8	126.0	30.	60.	0.	26.2	128.1	40.	220.	-25.	29.8	129.9	50.	352.	-20.
082618Z	21.5	122.9	35	21.7	123.0	35.	13.	0.	24.0	126.4	30.	81.	0.	26.9	128.5	40.	245.	-30.	30.7	130.2	50.	415.	-10.
082700Z	21.8	124.0	30	21.8	124.0	35.	0.	5.	24.0	127.2	30.	114.	-5.	27.1	129.2	25.	237.	-45.	0.0	0.0	0.	-0.	0.
082706Z	22.4	125.0	25	22.2	125.0	35.	12.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082712Z	22.8	126.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082718Z	23.0	127.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082800Z	23.5	129.2	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082806Z	24.1	130.6	50	24.2	130.8	35.	12.	-15.	26.9	135.7	50.	229.	-20.	30.2	139.6	50.	588.	5.	34.2	142.5	50.	887.	20.
082812Z	24.2	131.5	65	24.7	131.7	60.	32.	-5.	28.3	135.0	70.	283.	0.	36.6	138.8	45.	893.	5.	0.0	0.0	0.	-0.	0.
082818Z	24.2	131.9	70	24.6	132.2	60.	29.	-10.	27.6	135.4	65.	280.	5.	33.8	137.9	55.	719.	15.	0.0	0.0	0.	-0.	0.
082900Z	24.3	132.3	70	24.2	132.3	65.	6.	-5.	25.2	134.4	60.	167.	10.	27.7	136.5	50.	389.	15.	33.3	139.1	35.	796.	10.
082906Z	24.5	132.4	70	24.5	132.8	65.	22.	-5.	25.6	134.9	60.	218.	15.	28.2	136.8	50.	425.	20.	33.8	139.2	35.	856.	15.
082912Z	24.3	132.2	70	24.2	132.2	65.	6.	-5.	24.3	133.1	60.	106.	20.	25.6	135.2	50.	273.	20.	29.7	138.2	30.	696.	10.
082918Z	24.0	132.1	60	24.2	132.2	65.	13.	5.	24.6	133.3	55.	120.	15.	25.8	135.4	45.	316.	20.	0.0	0.0	0.	-0.	0.
083000Z	23.6	131.9	50	23.8	131.9	45.	12.	-5.	23.4	133.1	35.	80.	0.	24.3	136.1	25.	366.	0.	0.0	0.0	0.	-0.	0.
083006Z	23.3	131.8	45	23.3	131.8	45.	0.	0.	22.6	132.3	35.	43.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083012Z	23.0	131.8	40	22.9	131.8	40.	6.	0.	22.2	133.4	30.	136.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083018Z	23.0	132.0	40	22.8	132.1	40.	13.	0.	22.8	134.1	30.	199.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083100Z	22.8	131.8	35	22.7	131.9	40.	8.	5.	22.1	132.3	25.	159.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083106Z	22.9	131.6	30	22.9	131.8	35.	11.	5.	22.6	131.5	25.	156.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083112Z	23.0	131.1	30	22.9	131.2	30.	8.	0.	22.7	130.1	20.	127.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
083118Z	23.0	130.5	25	23.1	130.4	30.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090100Z	23.0	129.6	25	22.9	128.3	25.	72.	0.	23.4	124.4	20.	76.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090106Z	22.9	128.7	20	23.1	128.8	25.	13.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090112Z	22.8	127.8	20	23.0	128.1	25.	20.	5.	22.8	125.1	25.	96.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090118Z	23.0	126.8	25	22.9	127.2	25.	23.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090200Z	23.0	125.7	25	23.0	125.8	25.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090206Z	22.8	124.6	25	23.0	124.3	25.	20.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090212Z	22.5	123.4	30	22.4	123.2	25.	13.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090218Z	22.1	122.2	30	22.2	122.3	25.	8.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090300Z	21.6	121.1	25	21.6	121.2	20.	6.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090306Z	20.9	119.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	142.	384.	639.	17.	150.	376.	584.
AVG RIGHT ANGLE ERROR	8.	89.	273.	445.	9.	109.	290.	422.
AVG INTENSITY MAGNITUDE ERROR	6.	15.	26.	30.	7.	19.	28.	26.
AVG INTENSITY BIAS	-2.	3.	5.	7.	-3.	2.	1.	-7.
NUMBER OF FORECASTS	50	41	33	27	35	29	25	19

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2454. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

AD-A124 860 ANNUAL TROPICAL CYCLONE REPORT 1982(U) NAVAL OCEANOGRAPHY COMMAND CENTER/JOINT TYPHOON WARNING CENTER FPO SAN FRANCISCO 96630 1982

3/3

UNCLASSIFIED F/G 4/2 NL

END
DATE
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83
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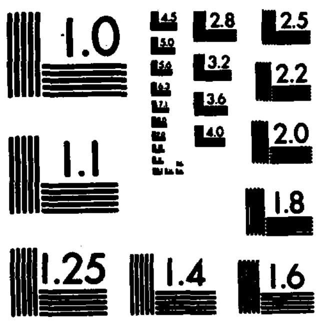

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

TYPHOON FAYE
FIX POSITIONS FOR CYCLONE NO. 15

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	200000	11.2N 122.7E	PCN 6			PGTW
* 2	200300	11.3N 122.3E	PCN 6	T1.0/1.0	INIT OBS	PGTW
3	200600	11.6N 123.4E	PCN 6			PGTW
4	200652	11.6N 123.7E	PCN 5	T1.5/1.5	INIT OBS	RPMK
5	200652	11.6N 123.0E	PCN 5	T1.0/1.0	INIT OBS	RODN
6	200900	11.7N 123.0E	PCN 6			PGTW
7	201200	11.9N 122.7E	PCN 6			PGTW
8	201600	12.2N 121.0E	PCN 6			PGTW
* 9	201800	12.5N 120.7E	PCN 6			PGTW
* 10	201937	11.8N 119.5E	PCN 5			RPMK
11	202100	12.5N 120.6E	PCN 6			PGTW
12	210000	12.1N 120.4E	PCN 6			PGTW
* 13	210300	12.0N 119.6E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
14	210600	12.3N 119.9E	PCN 6			PGTW
* 15	210640	12.8N 119.4E	PCN 5	T2.0/2.0 /D0.5/21HRS		RPMK
16	210900	12.7N 119.7E	PCN 6			PGTW
* 17	211200	12.7N 118.6E	PCN 6		ULCC FIX	PGTW
18	211600	12.4N 118.6E	PCN 6		ULCC FIX	PGTW
19	211800	12.4N 118.5E	PCN 6			PGTW
20	211925	11.8N 119.4E	PCN 5			RODN
21	212100	12.1N 119.1E	PCN 6		BRKS CONTINUITY	PGTW
22	220000	12.1N 119.4E	PCN 6			PGTW
23	220300	12.2N 119.6E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
24	220627	12.2N 119.6E	PCN 3			PGTW
25	220627	12.1N 119.5E	PCN 3	T3.0/3.0+/D1.0/24HRS		RPMK
26	220900	12.4N 119.5E	PCN 4			PGTW
27	221200	12.6N 119.4E	PCN 2		EYE OPEN N	PGTW
28	221600	12.6N 119.2E	PCN 2		EYE DIA 20NM	PGTW
29	221800	12.7N 119.0E	PCN 2			PGTW
30	221912	12.8N 119.1E	PCN 3			RPMK
31	222100	12.7N 118.9E	PCN 2		EYE OPEN N	PGTW
32	230000	12.7N 118.9E	PCN 2	T4.0/4.0 /D1.0/21HRS		PGTW
33	230300	12.8N 118.6E	PCN 2			PGTW
34	230615	12.7N 118.7E	PCN 1			PGTW
35	230615	12.5N 118.6E	PCN 1	T4.5/4.5 /D1.5/24HRS		RPMK
36	230615	12.4N 118.7E	PCN 1	T4.5/4.5+/D1.5/24HRS	EYE DIA 20NM	RODN
37	230900	12.7N 118.6E	PCN 2			PGTW
38	231200	12.8N 118.8E	PCN 2			PGTW
39	231600	12.9N 118.9E	PCN 2			PGTW
40	231751	13.0N 118.8E	PCN 2			RPMK
41	231800	13.0N 118.9E	PCN 2			PGTW
42	231900	13.0N 119.1E	PCN 1			PGTW
43	232100	13.1N 119.1E	PCN 2			PGTW
44	240000	13.3N 119.3E	PCN 2	T4.0/4.0 /S0.0/24HRS		PGTW
45	240300	13.7N 119.6E	PCN 2			PGTW
46	240603	14.1N 119.6E	PCN 1	T5.0/5.0 /D0.5/24HRS		RPMK
47	240603	14.2N 119.5E	PCN 1			PGTW
48	240900	14.6N 119.7E	PCN 2			PGTW
49	241200	15.2N 119.7E	PCN 2		EYE OPEN W	PGTW
50	241600	15.9N 119.6E	PCN 2			PGTW
51	241800	16.3N 119.4E	PCN 6			PGTW
52	241840	16.8N 119.6E	PCN 3			RPMK
53	242100	16.9N 119.4E	PCN 6			PGTW
54	250000	17.1N 120.1E	PCN 6	T3.5/4.0 /W0.5/24HRS		PGTW
55	250300	17.6N 120.1E	PCN 6			PGTW
56	250551	17.8N 119.9E	PCN 3	T3.5/4.5+/W1.5/24HRS		RPMK
57	250551	18.2N 119.7E	PCN 3			PGTW
58	250900	18.6N 119.6E	PCN 6			PGTW
59	251200	19.0N 119.5E	PCN 6			PGTW
60	251600	19.2N 119.8E	PCN 6			PGTW
61	251036	19.5N 120.0E	PCN 3			RPMK
62	251836	19.5N 119.9E	PCN 5			PGTW
63	252100	19.4N 120.1E	PCN 6			PGTW
64	260000	19.7N 120.6E	PCN 4	T2.5/3.0 /W1.0/24HRS		PGTW
65	260300	20.0N 120.0E	PCN 4			PGTW
66	260539	20.2N 121.4E	PCN 3	T3.0/3.5 /W0.5/24HRS		RPMK
67	260539	20.4N 121.4E	PCN 3		BASED ON EXTRAP	PGTW
68	260900	20.7N 121.5E	PCN 6			PGTW
69	261200	21.1N 121.6E	PCN 6			PGTW
70	261600	21.3N 122.2E	PCN 6			PGTW
71	261824	21.6N 122.7E	PCN 3			RPMK
72	261824	21.4N 122.5E	PCN 6			PGTW
73	262100	21.5N 123.1E	PCN 6			PGTW
74	270000	22.0N 123.8E	PCN 6	T2.5/2.5 /S0.0/24HRS		PGTW
75	270300	22.0N 124.5E	PCN 6			PGTW
76	270600	22.8N 125.7E	PCN 6			PGTW
77	271200	23.0N 126.7E	PCN 6			PGTW
78	271800	22.8N 127.0E	PCN 4			PGTW
79	271811	22.6N 127.2E	PCN 3			PGTW
80	272100	23.2N 128.5E	PCN 6		ULCC FIX	PGTW
81	280000	23.6N 129.5E	PCN 4	T2.5/2.5+/S0.0/24HRS		PGTW
82	280300	24.1N 130.2E	PCN 6			PGTW
83	280515	24.1N 130.4E	PCN 4			PGTW
84	280600	24.2N 130.6E	PCN 4			PGTW

85	280900	24.3N 131.1E	PCN 2				PGTW
86	281200	24.1N 131.5E	PCN 2				PGTW
87	281600	24.5N 131.7E	PCN 2				PGTW
88	281800	24.4N 132.0E	PCN 6				PGTW
89	282100	24.4N 132.2E	PCN 6				PGTW
90	290000	24.4N 132.3E	PCN 4				PGTW
91	290300	24.6N 132.5E	PCN 6	T4.0/4.0-/D1.5/27HRS			PGTW
92	290503	24.6N 132.5E	PCN 3				PGTW
93	290600	24.5N 132.2E	PCN 4				PGTW
94	290900	24.6N 132.3E	PCN 4				PGTW
95	291600	24.3N 132.3E	PCN 2				PGTW
96	291740	24.3N 132.3E	PCN 4		BASED ON EXTRAP		PGTW
97	292100	24.0N 132.0E	PCN 4		EXP LLCC		PGTW
98	300000	23.7N 131.9E	PCN 4				PGTW
99	300300	23.5N 131.9E	PCN 4	T2.5/3.0 /W1.5/24HRS			PGTW
100	300451	23.5N 131.8E	PCN 3				PGTW
101	300600	23.4N 131.8E	PCN 4				PGTW
102	300900	23.3N 131.7E	PCN 4				PGTW
103	301200	23.0N 131.8E	PCN 4		EXP LLCC		PGTW
104	301600	22.9N 132.0E	PCN 4		EXP LLCC		PGTW
105	301736	23.0N 132.0E	PCN 3		EXP LLCC		PGTW
106	302100	23.0N 132.0E	PCN 4		EXP LLCC		PGTW
107	310000	22.8N 131.8E	PCN 4				PGTW
108	310300	22.9N 131.7E	PCN 4	T1.0/2.0 /W1.0/24HRS			PGTW
109	310620	23.0N 131.6E	PCN 3				PGTW
110	310900	23.0N 131.5E	PCN 6				PGTW
111	311200	22.9N 131.3E	PCN 4				PGTW
112	311600	23.1N 130.6E	PCN 6				PGTW
113	311800	23.1N 130.4E	PCN 4				PGTW
114	311905	23.0N 130.4E	PCN 3				RODN
115	312100	22.9N 130.0E	PCN 4				PGTW
116	010000	23.0N 129.7E	PCN 4				PGTW
117	010300	23.0N 129.2E	PCN 4	T1.0/1.0 /W1.0/24HRS			PGTW
118	010600	22.9N 128.9E	PCN 3				PGTW
119	010900	23.0N 128.6E	PCN 4				PGTW
120	011200	23.0N 125.9E	PCN 4				PGTW
121	011200	22.8N 127.8E	PCN 4				PGTW
122	011800	23.0N 127.1E	PCN 4				PGTW
123	011835	23.0N 126.5E	PCN 3				PGTW
124	020000	22.9N 125.8E	PCN 4				PGTW
125	020300	22.8N 125.1E	PCN 3	T1.0/1.0 /S0.0/24HRS	EXP LLCC		PGTW
126	020556	22.5N 124.6E	PCN 3		EXP LLCC		PGTW
127	020900	22.6N 123.8E	PCN 6				PGTW
128	021200	22.5N 123.4E	PCN 6				PGTW
129	021600	22.4N 122.8E	PCN 6				PGTW
130	021800	22.2N 122.3E	PCN 6				PGTW
131	021841	21.9N 122.2E	PCN 5				PGTW
132	022100	21.5N 121.7E	PCN 6				PGTW
133	030000	21.5N 121.1E	PCN 6		BASED ON EXTRAP		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	221032	12.3N 119.4E	700MB	2965	984	60 170 10	260 80 170 10	3 2	CIRCULAR	10	+12 + 8	1
2	221200	12.3N 119.2E	700MB	2938			300 55 200 20	3 2	CIRCULAR	15	+12 +30 + 9	1
3	222024	12.6N 119.0E	700MB	2841			140 [illegible] 030 10	4 3			+14 +17 + 7	2
4	222259	12.7N 118.7E	700MB	2841	71	50 130 8	200 73 130 10	6 3	CIRCULAR	25	+11 +15 + 8	2
5	230750	12.6N 118.7E	700MB	2746		65 270 5	010 105 270 10	5 2	ELLIPTICAL	25 15 060	+11 +18 +11	3
6	230953	12.8N 118.6E	700MB	2745	963	65 150 30	220 100 140 8	5 3	CIRCULAR	15	+12 +16 +10	3
7	232032	13.0N 119.3E	700MB	2746			030 77 320 10	10 3	CIRCULAR	25	+14 +10	4
8	240706	14.2N 119.7E	700MB	2739		80 010 10	100 95 010 10	2 1				5
9	240907	14.4N 119.7E	700MB	2743	963	80 050 8		2 1	ELLIPTICAL	20 15 340	+10 + 9	5
10	250751	18.3N 119.0E	700MB	2990		40 030 8	240 37 170 8	4 3			+15 + 9	7
11	252303	19.7N 120.5E	700MB	2992	987	70 140 15	240 47 140 15	15 2			+10 +10 + 8	8
12	260710	20.7N 121.4E	700MB	3035		40 090 30	160 41 090 25	10 5				9
13	261006	20.9N 121.8E	700MB	3044	997	40 350 25	060 36 020 13	5 5			+14 +10	9
14	262237	21.6N 123.7E	700MB	3070	990	30 210 30	220 43 050 30	3 1	CIRCULAR	25	+16 +17	10
15	270701	22.7N 125.2E	700MB			15 270 30	350 19 270 30	20 20				11
16	281935	24.2N 132.0E	700MB	2895			360 69 300 5	6 5				12
17	282222	24.2N 132.1E	700MB	2890	979	70 290 5	290 60 240 10	5 5	CIRCULAR	12	+11 +15 +10	12
18	291042	24.0N 132.1E	700MB	2941	982		030 69 310 30	10 3	CIRCULAR	13	+13 +21	14
19	291153	24.1N 132.1E	700MB	2960			020 71 270 9	10 3				14
20	292326	23.7N 132.0E	700MB	3029		50 200 30	200 25 200 30	3 10			+11 +17 + 8	15
21	300753	23.2N 131.0E	1500FT		996	40 010 20	070 37 360 20	8 5				16
22	300929	23.1N 131.0E	1500FT		997	40 240 15	020 46 240 10	8 6			+23 +27 +25 27	16
23	302020	23.0N 132.0E	700MB	3060			260 31 140 50	2 4				17
24	302140	22.0N 131.0E	1500FT		996	40 270 25	350 41 270 10	2 4			+24 +26 +24 30	17
25	310730	23.0N 131.5E	1500FT		999	35 090 15	130 10 010 105	10 2				18
26	310907	23.0N 131.4E	1500FT		999	30 150 15	130 21 060 30	15 2			+23 +25 +25	18
27	312143	23.0N 129.0E	1500FT		997	25 090 5	030 27 090 5	6 3			+25 +27 +26 27	19

RADAR FIXES

	FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
	1	232200	13.3N 119.6E	LAND				10571 52105		14.8N 120.2E	98426
	2	232300	13.3N 119.6E	LAND				20511 50307		14.8N 120.2E	98426
	3	240100	13.6N 119.4E	LAND				1151/ 50006		14.8N 120.2E	98426
	4	240200	13.7N 119.4E	LAND				1142/ 50107		14.8N 120.2E	98426
	5	240300	13.8N 119.4E	LAND				1040/ 70207	BEST TRACK 015 DEG 07 KTS	14.8N 120.2E	98426
*	6	240400	13.4N 119.7E	LAND				1001/ 43605	EYE 80 PCT CIR OPEN SE	16.3N 120.6E	98321
	7	240400	13.9N 119.5E	LAND				1141/ 00207		14.8N 120.2E	98426
*	8	240500	13.4N 119.7E	LAND				1001/ 43602	EYE 90 PCT CIR OPEN SE	16.3N 120.6E	98321
	9	240600	14.1N 119.6E	LAND				1141/ 00207		14.8N 120.2E	98426
*	10	240600	13.6N 119.7E	LAND				1193/ 43605		16.3N 120.6E	98321
*	11	240630	13.6N 119.7E	LAND				10A03 43604		16.3N 120.6E	98321
	12	240700	14.2N 119.6E	LAND				1141/ 90207	BEST TRACK 016 DEG 07 KTS	14.8N 120.2E	98426
*	13	240700	13.7N 119.7E	LAND				10603 43605	EYE 100 PCT CIR	16.3N 120.6E	98321
*	14	240800	13.9N 119.8E	LAND				10703 40205	EYE 100 PCT CIR	16.3N 120.6E	98321
*	15	240900	14.1N 119.8E	LAND				10623 43605		16.3N 120.6E	98321
*	16	240930	14.2N 119.8E	LAND				11033 43606	EYE 90 PCT ELPTCL	16.3N 120.6E	98321
*	17	241130	14.6N 119.9E	LAND				1061/ 40106	EYE 100 PCT CIR	16.3N 120.6E	98321
	18	241200	15.0N 119.8E	LAND				1141/ 00209		14.8N 120.2E	98426
*	19	241700	15.6N 119.6E	LAND				1031/ 43303		16.3N 120.6E	98321
*	20	241930	15.9N 119.8E	LAND				1031/ 40205	EYE 100 PCT CIR DIA 11NM	16.3N 120.6E	98321
	21	242030	16.1N 119.9E	LAND				1021/ 40306	EYE 100 PCT CIR DIA 9NM	16.3N 120.6E	98321
	22	242035	16.0N 120.2E	LAND	POOR					15.2N 120.6E	98327
	23	242100	16.3N 120.0E	LAND				1021/ 40200	EYE 100 PCT CIR DIA 9NM	16.3N 120.6E	98321
	24	242130	16.2N 120.2E	LAND	FAIR	ELLIPTICAL			ELIP AXIS 20/10	15.2N 120.6E	98327
	25	242200	16.7N 120.2E	LAND				1022/ 40200	EYE 100 PCT CIR DIA 9NM	16.3N 120.6E	98321
	26	242230	16.8N 120.2E	LAND				1021/ 43600	EYE 100 OCT CIR DIA 9NM	16.3N 120.6E	98321
	27	250000	17.3N 120.3E	LAND				1031/ 40100	EYE 80 PCT CIR OPEN NNE	16.3N 120.6E	98321
	28	250030	17.4N 120.4E	LAND				21905 /////	EYE ELLIPTICAL	18.3N 121.6E	98231
*	29	250030	17.6N 120.3E	LAND				4//// 43616		16.3N 120.6E	98321
*	30	250300	18.3N 120.2E	LAND				11/// 53607		16.3N 120.6E	98321
*	31	250600	18.6N 120.1E	LAND				1061/ 43405		16.3N 120.6E	98321
	32	250900	18.6N 119.7E	LAND				29714 53603		18.3N 121.6E	98231
*	33	250900	18.8N 119.7E	LAND				115// 40000		16.3N 120.6E	98321
	34	251130	18.6N 120.0E	LAND				10703 43600		18.3N 121.6E	98231
	35	251130	18.8N 119.8E	LAND				115// 40000		16.3N 120.6E	98321
	36	251330	18.8N 120.1E	LAND				40403 32702		18.3N 121.6E	98231
	37	251330	19.1N 120.1E	LAND				1151/ 43607		16.3N 120.6E	98321
	38	251400	18.9N 120.2E	LAND				10403 40205		18.3N 121.6E	98231
*	39	251400	19.3N 120.2E	LAND				1196/ 40100		16.3N 120.6E	98321
	40	252200	19.6N 120.4E	LAND				2///1 53614		22.6N 120.2E	46744
	41	261300	21.3N 121.9E	LAND				6//// 59999		22.6N 120.2E	46744

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	192100	11.2N 125.0E	020	010	WMO 98555
2	210000	12.1N 121.0E	030	075	WMO 98630
3	241100	14.8N 119.8E	000	030	WMO 98426 CUBI PT

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON GORDON
BEST TRACK DATA

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
MO/DA/HR	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
082700Z	14.6 153.0	30	14.5 153.0	30.	6.	0.	17.8 150.1	60.	40.	-5.	22.5 149.3	70.	53.	-15.	27.8 153.6	75.	326.	-25.
082706Z	15.5 152.5	35	15.5 152.4	35.	6.	0.	19.8 148.8	65.	118.	-5.	23.8 148.7	70.	75.	-20.	27.5 150.3	70.	168.	-30.
082712Z	16.2 151.8	45	16.4 151.3	45.	31.	0.	20.8 148.6	70.	125.	-5.	24.8 149.1	70.	43.	-25.	28.3 151.1	70.	229.	-25.
082718Z	17.0 151.2	55	16.7 150.6	50.	39.	-5.	19.6 148.8	70.	123.	-10.	22.3 148.6	70.	132.	-30.	25.1 149.2	70.	133.	-20.
082800Z	17.8 150.8	65	17.7 150.7	55.	8.	-10.	20.6 149.2	65	111.	-20.	23.2 148.6	75.	109.	-25.	26.0 148.1	85.	82.	0.
082806Z	18.8 150.6	70	18.5 150.3	60.	25.	-10.	21.8 149.5	70.	87.	-20.	24.7 149.4	80.	93.	-20.	27.4 149.9	85.	200.	0.
082812Z	19.9 150.6	75	20.0 150.7	70.	8.	-5.	24.0 150.6	80.	71.	-15.	27.2 151.0	90.	194.	-5.	29.6 152.8	95.	411.	10.
082818Z	21.0 150.4	80	20.8 150.3	75.	13.	-5.	24.5 150.4	85.	87.	-15.	26.8 152.9	90.	307.	0.	28.3 157.0	90.	642.	5.
082900Z	22.2 150.2	85	22.0 150.2	80.	12.	-5.	25.3 148.9	90.	33.	-10.	27.2 146.2	95.	44.	10.	30.1 143.1	95.	200.	5.
082906Z	23.2 149.9	90	23.2 150.2	85.	17.	-5.	25.9 147.8	95.	21.	-5.	28.2 144.6	90.	115.	5.	31.8 142.5	90.	298.	0.
082912Z	24.1 149.3	95	24.2 149.6	100.	17.	5.	26.8 147.0	125.	53.	30.	29.2 143.7	105.	166.	20.	34.9 142.2	90.	471.	5.
082918Z	24.5 148.8	100	24.9 149.1	100.	29.	0.	27.2 146.1	115.	76.	25.	30.2 143.2	95.	214.	10.	38.0 143.0	75.	643.	-10.
083000Z	25.0 148.4	100	24.9 148.3	100.	8.	0.	27.1 145.6	110.	69.	25.	30.4 142.2	95.	237.	5.	40.4 141.2	65.	769.	-15.
083006Z	25.6 148.0	100	25.7 147.9	90.	8.	-10.	27.5 145.3	80.	60.	-5.	29.1 141.9	70.	160.	-20.	35.6 140.8	60.	480.	-15.
083012Z	26.1 147.6	95	26.2 147.4	90.	12.	-5.	27.8 144.7	80.	68.	-5.	30.3 141.2	70.	222.	-15.	37.3 140.8	55.	570.	-20.
083018Z	26.4 147.2	90	26.7 147.2	85.	18.	-5.	28.2 145.1	75.	72.	-10.	30.0 142.3	70.	162.	-15.	37.4 140.2	50.	552.	-25.
083100Z	26.7 146.8	85	26.9 146.7	85.	13.	0.	28.4 143.6	75.	97.	-15.	29.2 140.2	70.	128.	-10.	30.8 136.5	65.	197.	-10.
083106Z	26.9 146.2	85	27.0 146.3	85.	8.	0.	28.2 144.2	70.	73.	-20.	28.9 141.2	65.	80.	-10.	29.8 137.9	60.	86.	-15.
083112Z	27.0 145.6	85	27.2 145.8	90.	16.	5.	28.2 143.9	85.	73.	0.	29.0 141.4	80.	89.	5.	30.7 138.3	75.	99.	0.
083118Z	27.0 145.0	85	27.0 145.2	90.	11.	5.	27.4 142.8	85.	22.	0.	28.8 140.2	80.	42.	5.	31.3 138.2	70.	130.	-5.
090100Z	27.0 144.5	90	27.0 144.4	90.	5.	0.	27.7 141.4	90.	22.	10.	30.0 139.5	85.	78.	10.	33.2 139.2	80.	176.	5.
090106Z	27.0 144.0	90	26.9 143.9	90.	8.	0.	27.6 141.7	90.	43.	15.	29.8 139.7	80.	39.	5.	32.8 139.2	70.	192.	0.
090112Z	27.1 143.3	85	27.0 143.4	90.	8.	5.	27.4 141.2	85.	49.	10.	29.8 139.7	75.	19.	0.	32.6 139.2	55.	263.	-15.
090118Z	27.3 142.4	85	27.2 142.7	90.	17.	5.	28.5 140.6	80.	46.	5.	31.1 139.2	70.	83.	-5.	34.0 138.9	50.	368.	-20.
090200Z	27.6 141.8	80	27.6 141.6	80.	11.	0.	28.9 138.9	65.	29.	-10.	29.0 136.6	60.	262.	-15.	28.9 134.0	55.	812.	-10.
090206Z	27.6 140.9	75	27.6 140.8	75.	5.	0.	28.4 137.7	65.	101.	-10.	28.7 134.9	55.	450.	-15.	29.2 132.2	50.	975.	-15.
090212Z	27.8 140.4	75	27.7 140.5	75.	8.	0.	28.2 138.7	70.	91.	-5.	28.7 136.0	60.	501.	-10.	0.0 0.0	0.	-0.	0.
090218Z	28.2 139.8	75	28.1 139.9	75.	8.	-0.	29.2 137.3	65.	165.	-10.	29.2 134.7	55.	666.	-15.	0.0 0.0	0.	-0.	0.
090300Z	28.7 139.4	75	28.6 139.2	75.	12.	0.	29.7 137.0	60.	227.	-15.	29.0 134.4	55.	766.	-10.	0.0 0.0	0.	-0.	0.
090306Z	29.2 139.4	75	29.2 138.7	70.	37.	-5.	30.6 136.2	60.	346.	-10.	30.5 133.0	50.	890.	-15.	0.0 0.0	0.	-0.	0.
090312Z	29.5 139.6	75	29.6 139.4	75.	12.	0.	32.0 140.7	65.	195.	-5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090318Z	30.1 140.3	75	29.8 139.9	75.	20.	0.	32.2 140.8	65.	303.	-5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090400Z	30.8 141.2	75	31.0 141.2	75.	12.	0.	37.2 145.7	50.	151.	-15.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090406Z	31.8 142.8	70	32.0 142.6	70.	16.	0.	39.7 148.2	45.	163.	-20.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090412Z	32.9 144.4	70	33.0 144.9	75.	26.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090418Z	34.3 146.3	70	34.3 146.4	70.	5.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090500Z	35.5 148.0	65	35.5 148.2	70.	10.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
090506Z	37.1 149.2	65	37.1 149.6	65.	19.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	108.	214.	364.	15.	108.	214.	364.
AVG RIGHT ANGLE ERROR	11.	63.	101.	218.	11.	63.	101.	218.
AVG INTENSITY MAGNITUDE ERROR	3.	11.	12.	12.	3.	11.	12.	12.
AVG INTENSITY BIAS	-1.	-4.	-7.	-9.	-1.	-4.	-7.	-9.
NUMBER OF FORECASTS	38	34	30	26	37	34	30	26

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2014. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TYPHOON GORDON
FIX POSITIONS FOR CYCLONE NO. 16

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	251800	9.0N 160.0E	PCN 6			PGTW
2	260000	10.5N 159.4E	PCN 6	T1.0/1.0	INIT OBS	PGTW
3	260600	11.7N 158.0E	PCN 6			PGTW
4	261200	12.9N 156.1E	PCN 6			PGTW
5	261642	13.2N 154.8E	PCN 5			PGTW
6	262100	13.9N 154.2E	PCN 6			PGTW
7	270000	14.0N 153.5E	PCN 6			PGTW
8	270300	15.0N 152.8E	PCN 6			PGTW
9	270345	15.5N 152.8E	PCN 5	T2.5/2.5 /D1.5/20HRS		PGTW
10	270600	15.7N 152.2E	PCN 6			PGTW
11	270900	15.9N 151.9E	PCN 6			PGTW
12	271200	16.0N 151.5E	PCN 6			PGTW
13	271600	16.4N 151.1E	PCN 6			PGTW
14	271630	16.2N 151.3E	PCN 5			PGTW
15	271800	16.7N 151.0E	PCN 6			PGTW
16	272100	16.9N 151.0E	PCN 6			PGTW
17	280000	17.0N 151.1E	PCN 6			PGTW
18	280300	18.2N 150.8E	PCN 2	T4.0/4.0 /D1.5/24HRS		PGTW
19	280600	18.8N 151.0E	PCN 2			PGTW
20	280900	19.4N 150.8E	PCN 5			PGTW
21	281200	20.0N 150.5E	PCN 6			PGTW
22	281600	20.5N 150.5E	PCN 6			PGTW
23	281610	20.5N 150.4E	PCN 6			PGTW
24	281800	21.0N 150.6E	PCN 6			PGTW
25	282100	21.8N 150.5E	PCN 6			PGTW
26	290000	22.4N 150.3E	PCN 2			PGTW
27	290300	22.7N 150.2E	PCN 2	T5.0/5.0-/D1.0/24HRS		PGTW
28	290503	23.1N 150.2E	PCN 1			PGTW
29	290600	23.4N 150.0E	PCN 2			PGTW
30	290900	23.9N 149.0E	PCN 2			PGTW
31	291600	24.6N 148.1E	PCN 4			PGTW
32	291740	24.7N 148.6E	PCN 4			PGTW
33	292100	24.8N 148.5E	PCN 2			PGTW
34	300000	25.0N 148.4E	PCN 4			PGTW
35	300300	25.5N 148.4E	PCN 4	T3.5/4.5 /W1.5/24HRS		PGTW
36	300451	25.5N 148.3E	PCN 3			PGTW
37	300600	25.8N 148.2E	PCN 4			PGTW
38	300900	26.0N 147.9E	PCN 4			PGTW
39	301200	26.3N 147.8E	PCN 2			PGTW
40	301600	26.4N 147.6E	PCN 2			PGTW
41	301736	26.4N 147.3E	PCN 1			PGTW
42	302100	26.8N 147.1E	PCN 2			PGTW
43	310000	26.7N 146.8E	PCN 2			PGTW
44	310300	27.0N 146.6E	PCN 2	T4.0/4.0 /D0.5/24HRS		PGTW
45	310430	26.8N 146.7E	PCN 1			PGTW
46	310600	27.1N 146.4E	PCN 2			PGTW
47	310900	26.9N 146.0E	PCN 2			PGTW
48	311200	27.0N 145.7E	PCN 2			PGTW
49	311600	26.8N 145.4E	PCN 2			PGTW
50	311800	27.0N 145.2E	PCN 2			PGTW
51	312100	27.0N 144.8E	PCN 2			PGTW
52	010000	27.0N 144.6E	PCN 2			PGTW
53	010300	26.9N 144.3E	PCN 2	T5.0/5.0-/D1.0/24HRS		PGTW
54	010426	27.0N 144.2E	PCN 1			PGTW
55	010600	27.2N 144.0E	PCN 2			PGTW
56	010900	26.9N 143.8E	PCN 2			PGTW
57	011200	26.8N 143.3E	PCN 6			PGTW
58	011600	27.3N 142.8E	PCN 2			PGTW
59	011711	27.4N 142.4E	PCN 2			PGTW
60	011800	27.7N 142.5E	PCN 2			PGTW
61	012100	27.6N 142.1E	PCN 6			PGTW
62	020000	27.5N 141.7E	PCN 4		MLCC FIX	PGTW
63	020414	27.4N 141.0E	PCN 1	T4.0/4.5 /W1.0/25HRS		PGTW
64	020600	27.5N 140.8E	PCN 4		ULCC FIX	PGTW
65	020900	27.6N 140.6E	PCN 4		ULCC FIX	PGTW
66	021200	27.8N 140.5E	PCN 4			PGTW
67	021600	28.2N 140.0E	PCN 4			PGTW
68	021800	28.4N 139.8E	PCN 4			PGTW
69	021841	28.4N 139.7E	PCN 3			PGTW
70	022100	28.4N 139.6E	PCN 4			PGTW
71	030000	28.6N 139.5E	PCN 4			PGTW
72	030300	28.9N 139.2E	PCN 2		EYE OPEN SW	PGTW
73	030544	29.1N 139.3E	PCN 1	T4.0/4.0 /S0.0/25HRS		PGTW
74	030900	29.4N 139.5E	PCN 2			PGTW
75	031200	29.5N 139.4E	PCN 4			PGTW
76	031829	30.0N 140.6E	PCN 3		ULCC FIX	PGTW
77	032100	30.5N 140.8E	PCN 4		ULCC FIX	PGTW
78	040000	31.0N 141.2E	PCN 4			PGTW
79	040300	31.3N 142.0E	PCN 4			PGTW
80	040532	31.4N 142.0E	PCN 3	T3.0/4.0 /W1.0/24HRS		PGTW
81	040600	31.4N 142.8E	PCN 4			PGTW
82	040900	32.3N 143.8E	PCN 6			PGTW
83	041200	33.3N 144.5E	PCN 6			PGTW

84	041600	33.6N 145.8E	PCN 6		PGTW
85	041800	33.9N 146.5E	PCN 6		PGTW
86	042100	34.0N 147.0E	PCN 6		PGTW
87	050000	35.9N 147.9E	PCN 4		PGTW
88	050300	36.4N 148.4E	PCN 4	T3.0/3.0 /00.0/23HRS	PGTW
89	050600	37.1N 149.2E	PCN 4		PGTW
90	050900	38.0N 149.9E	PCN 4		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	ORIEN-TATION	EYE TEMP (C) OUT/	IN/	DP/SST	MSN NO.
1	262347	14.5N 153.9E	1500FT		1001	30 030 40	150 36 030 40	2 4					+25		1
2	271026	16.2N 151.0E	700MB	2990	991		330 34 250 20	15 3	CIRCULAR	10		+10	+12	+12	2
3	272335	17.7N 150.7E	700MB	2894	977	50 140 30	300 45 100 12	12 8				+ 9	+13	+10	3
4	280705	18.0N 150.6E	700MB	2835	972	75 090 20	210 89 090 30	10 5							4
5	280852	19.4N 150.6E	700MB	2807			160 89 000 25	10 3	CIRCULAR	25		+12	+10	+12	4
6	282012	21.4N 150.2E	700MB	2676	953	80 100 8	200 85 100 10	5 2	CIRCULAR	30		+14	+19	+10	5
7	290644	23.3N 149.0E	700MB	2629	946	100 190 20	100 99 100 30	5 4	CIRCULAR	10		+17	+18	+18	6
8	290853	23.7N 149.7E	700MB	2612		80 320 60	040 71 320 30	10 4	CIRCULAR	20		+16	+17	+16	6
9	291906	24.7N 148.8E	700MB	2607		70 270 90	300 73 210 31	5 5	CIRCULAR	40		+14	+18	+16	7
10	300604	25.6N 147.9E	700MB	2616		50 130 120	250 79 150 35	5 5							8
11	300832	25.7N 147.9E	700MB	2612	945	65 040 120	110 80 030 36	5 5	CIRCULAR	30		+13	+18	+16	8
12	301800	26.4N 147.2E	700MB	2617			190 90 000 57	5 3	ELLIPTICAL	45 25	310		+19		9
13	302043	26.6N 147.0E	700MB	2631	947	80 270 30	090 81 350 80	3 3	CIRCULAR	30		+16	+17	+15	9
14	310602	27.1N 146.2E	700MB	2624		65 170 65	200 76 170 60	10 5							10
15	310833	27.0N 146.1E	700MB	2624	947	65 270 30	030 85 250 60	10 5	CIRCULAR	20		+14	+16	+15	10
16	311811	26.8N 145.0E	700MB	2652			070 82 300 90	2 3							11
17	312057	27.0N 144.7E	700MB	2661	952		220 85 120 60	2 6	CIRCULAR	25		+15	+17	+15	11
18	010810	27.0N 143.8E	700MB	2657	949	65 300 120	050 68 310 70	2 5	CIRCULAR	20		+18	+18	+15	12
19	011851	27.5N 142.3E	700MB	2729			130 59 050 120	3 3							13
20	012036	27.2N 141.9E	700MB	2742	960	65 310 90	060 67 310 60	3 5	CIRCULAR	10		+12	+16	+16	13
21	020905	27.6N 140.8E	700MB	2740	960	55 350 110	100 73 360 127	8 3	ELLIPTICAL	7 5	040	+14	+17	+15	14
22	021155	27.8N 140.5E	700MB	2772			100 81 000 72	15 2	CONCENTRIC						14
23	021938	28.3N 139.3E	700MB	2820			000 77 010 87	5 6							15
24	022206	28.5N 139.5E	700MB	2834		65 260 90	160 75 000 110	4 6	CIRCULAR	15		+15	+16	+14	15
25	030857	29.3N 139.4E	700MB	2778	963	65 350 90	000 64 350 120	4 2	CIRCULAR	20		+16	+16	+14	16
26	031200	29.3N 139.4E	700MD	2805			100 84 090 110	4 2							16
27	031431	29.4N 139.8E	700MB	2802	968			5 6	CIRCULAR	15		+14	+15	+13	17
28	031801	30.2N 140.4E	700MB	2796			190 76 090 90	3 5							17
29	032123	30.7N 140.7E	700MB	2787	964	80 320 60	330 75 260 45	2 4				+17	+17	+15	18
30	040012	30.8N 141.2E	700MB	2773		60 190 11	200 85 000 87	3 3							18
31	040230	31.4N 142.0E	700MB	2805	965	90 320 105	160 61 030 70	5 1				+15	+18	+14	18
32	040857	32.2N 143.7E	700MB	2794	966	80 290 130	250 96 170 85	8 10				+15	+15	+15	19
33	041205	32.9N 144.5E	700MB	2790			100 71 110 90	8 10							19
34	041440	33.3N 145.1E	700MB	2806			260 84 170 90	8 10				+17	+16	+15	19
35	042123	35.1N 147.4E	700MB	2849	973	80 090 120	150 70 090 100	2 4				+12	+14	+14	20
36	050000	35.6N 147.0E	700MB	2840		60 100 90	010 70 020 60	2 2							20

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM HOPE
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
090400Z	16.2	118.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090406Z	16.5	118.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090412Z	16.6	117.7	35	16.8	118.0	30.	21.	-5.	17.8	116.8	40.	199.	-15.	18.4	115.4	50.	401.	-10.	0.0	0.0	0.	-0.	0.
090418Z	16.6	116.9	40	17.0	117.8	30.	57.	-10.	18.0	116.4	40.	249.	-20.	18.6	115.0	50.	450.	0.	0.0	0.0	0.	-0.	0.
090500Z	16.6	116.0	45	16.5	116.0	40.	6.	-5.	16.8	114.2	50.	176.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090506Z	16.5	114.8	50	16.5	115.4	45.	35.	-5.	17.3	113.6	50.	218.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090512Z	16.5	113.6	55	16.5	113.6	55.	0.	0.	17.9	109.9	60.	142.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090518Z	16.4	112.4	60	16.4	112.2	60.	12.	0.	17.8	108.2	60.	134.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090600Z	16.2	111.2	60	16.2	111.0	60.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090606Z	15.9	110.1	60	16.0	109.6	60.	29.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090612Z	15.7	109.0	60	15.8	109.0	60.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090618Z	15.6	107.8	50	15.5	108.0	40.	13.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	19.	186.	426.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	9.	79.	110.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	4.	11.	5.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-4.	-8.	-5.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	10	6	2	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 638. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

TROPICAL STORM HOPE
FIX POSITIONS FOR CYCLONE NO. 17

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	041600	15.5N 115.6E	PCN 6			PGTW
2	040000	16.4N 118.3E	PCN 6	T2.0/2.0	INIT OBS	PGTW
3	040300	16.5N 118.3E	PCN 6			PGTW
4	040600	16.7N 118.5E	PCN 4			PGTW
5	040714	16.7N 118.1E	PCN 5	T2.0/2.0	INIT OBS	RPMK
6	040900	15.9N 117.5E	PCN 6			PGTW
* 7	041200	16.0N 116.4E	PCN 6			PGTW
* 8	041800	16.5N 116.9E	PCN 6			PGTW
9	042100	17.1N 116.6E	PCN 6			PGTW
10	050000	16.5N 115.3E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
11	050300	16.5N 115.2E	PCN 6			PGTW
12	050600	16.3N 114.5E	PCN 6			PGTW
13	050702	16.3N 114.4E	PCN 5	T3.5/3.5+/D1.5/24HRS		RPMK
14	050900	16.3N 114.2E	PCN 6			PGTW
15	051200	16.1N 113.1E	PCN 6			PGTW
16	051600	16.1N 111.9E	PCN 6			PGTW
17	051800	16.2N 111.6E	PCN 6			PGTW
18	052100	16.0N 111.9E	PCN 6			PGTW
19	060000	15.8N 110.8E	PCN 6			PGTW
20	060300	15.5N 110.2E	PCN 6	T3.5/3.5-/D0.5/27HRS		PGTW
21	060600	15.8N 109.8E	PCN 6			PGTW
22	060650	15.5N 110.2E	PCN 5	T4.0/4.0-/D0.5/24HRS		RPMK
23	060900	15.7N 109.5E	PCN 6			PGTW
24	061200	15.7N 109.1E	PCN 6		ULCC FIX	PGTW
25	061600	15.8N 108.3E	PCN 6		ULCC FIX	PGTW
26	061800	15.7N 107.9E	PCN 6		ULCC FIX	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	042357	16.5N 116.0E	700MB	2986	994	45 060 10	160 47 050 12	5 5			+13 +17 +10	

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	051750	16.9N 112.7E	LAND				5///3 42716		16.0N 112.3E	59981
2	052050	17.1N 112.0E	LAND				5///3 42712		16.0N 112.3E	59981

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	041200	16.0N 118.0E	030	030	HBDF SHIP OBSERVATION
2	041800	16.0N 117.1E	035	100	HBDF SHIP OBSERVATION
3	051800	16.5N 112.3E	060	020	WMO 59981
4	060000	16.2N 111.2E	060	025	WMO 59985

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON IRVING
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
090418Z	13.0	133.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090500Z	12.9	132.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090506Z	13.2	132.2	30	13.2	132.1	30.	6.	0.	14.0	130.5	40.	124.	5.	15.0	127.0	55.	190.	0.	16.3	124.5	65.	192.	5.
090512Z	13.7	131.4	30	13.6	131.7	30.	18.	0.	15.2	130.0	45.	163.	5.	15.9	127.0	60.	187.	0.	16.4	123.7	70.	192.	15.
090518Z	14.1	130.7	30	13.9	131.0	35.	21.	5.	14.9	128.7	50.	117.	5.	15.6	125.7	65.	156.	5.	15.9	122.2	70.	173.	20.
090600Z	14.2	129.6	35	14.3	129.8	35.	13.	0.	15.5	126.2	50.	165.	0.	15.8	122.5	70.	230.	10.	16.8	118.6	60.	292.	10.
090606Z	13.7	128.7	35	14.4	128.2	40.	51.	5.	15.0	124.0	50.	193.	-5.	16.2	120.0	45.	316.	-15.	18.4	117.0	55.	391.	5.
090612Z	13.2	128.1	40	13.4	128.2	50.	13.	10.	13.0	125.0	65.	65.	5.	13.4	121.0	55.	117.	0.	14.0	118.2	55.	158.	5.
090618Z	13.2	127.7	45	13.2	127.5	55.	12.	10.	13.0	124.0	60.	99.	0.	13.6	120.0	55.	136.	5.	14.2	117.2	60.	170.	10.
090700Z	12.9	127.1	50	13.0	127.0	60.	8.	10.	13.0	124.1	70.	64.	10.	13.5	121.2	55.	70.	5.	13.9	118.4	60.	76.	10.
090706Z	12.9	126.5	55	12.9	126.2	60.	18.	5.	13.1	123.2	60.	70.	0.	13.0	120.4	55.	82.	5.	14.3	117.3	60.	75.	10.
090712Z	12.9	126.1	60	13.0	126.1	60.	6.	0.	13.0	123.9	55.	13.	0.	13.7	120.0	50.	31.	0.	14.3	117.0	60.	57.	5.
090718Z	13.0	125.7	60	12.8	125.4	60.	21.	0.	13.0	122.5	50.	37.	0.	14.1	119.5	55.	42.	5.	15.0	116.3	60.	26.	0.
090800Z	13.0	125.2	60	13.1	125.4	60.	13.	0.	13.2	123.3	55.	50.	5.	13.7	120.9	50.	122.	0.	14.9	118.3	55.	141.	-10.
090806Z	13.1	124.4	60	13.1	124.3	60.	6.	0.	13.5	121.4	50.	29.	0.	14.6	118.0	55.	42.	5.	16.2	115.9	60.	51.	-5.
090812Z	13.2	123.8	55	13.0	123.7	55.	13.	0.	13.8	120.5	50.	33.	0.	15.2	117.8	55.	17.	0.	16.8	114.8	60.	60.	10.
090818Z	13.2	123.1	50	13.2	122.8	55.	18.	5.	14.2	119.8	50.	25.	0.	15.5	117.2	60.	34.	0.	17.3	114.0	60.	72.	-15.
090900Z	13.6	122.4	50	13.4	122.4	50.	12.	0.	13.8	120.0	50.	81.	0.	14.2	117.5	55.	114.	-10.	14.7	113.8	60.	106.	20.
090906Z	13.8	121.8	50	13.6	121.8	50.	12.	0.	14.0	119.4	50.	92.	0.	14.3	116.7	55.	104.	-10.	14.7	112.9	60.	136.	-30.
090912Z	14.2	120.9	50	14.1	120.8	50.	8.	0.	14.6	118.2	60.	54.	5.	14.9	114.0	60.	54.	-10.	15.4	110.5	60.	213.	-30.
090918Z	14.5	120.1	50	14.8	119.8	50.	25.	0.	15.9	116.5	60.	44.	0.	16.5	113.2	60.	77.	-15.	17.0	109.2	60.	241.	-30.
091000Z	14.9	119.2	50	15.0	119.0	50.	13.	0.	16.0	115.6	60.	45.	-5.	16.8	112.2	60.	123.	-20.	18.1	108.5	55.	269.	-30.
091006Z	15.1	118.3	50	15.0	117.7	50.	35.	0.	15.1	114.3	60.	60.	-5.	15.1	111.4	65.	178.	-25.	16.3	107.9	50.	315.	-30.
091012Z	15.2	117.5	55	15.3	117.6	55.	8.	0.	16.7	114.0	65.	54.	-5.	16.9	111.9	60.	109.	-30.	17.0	109.4	55.	209.	-20.
091018Z	15.2	116.7	60	15.5	116.8	60.	19.	0.	16.0	114.2	60.	40.	-15.	17.0	111.2	55.	120.	-35.	17.0	108.2	50.	266.	-25.
091100Z	15.3	115.9	65	15.4	115.8	60.	8.	-5.	16.2	112.8	55.	87.	-25.	16.6	109.8	50.	206.	-35.	16.7	106.0	35.	338.	-35.
091106Z	15.5	115.4	65	15.8	115.2	60.	21.	-5.	16.5	112.3	55.	90.	-35.	16.5	109.4	50.	230.	-30.	16.7	106.9	35.	320.	35.
091112Z	15.8	114.9	70	15.8	114.8	60.	6.	-10.	16.9	112.6	55.	69.	-35.	17.3	110.2	50.	160.	-25.	17.3	107.0	[illegible]	262.	15.
091118Z	16.2	114.5	75	16.2	114.5	65.	0.	-10.	18.0	113.7	70.	40.	-20.	19.2	112.0	65.	41.	-10.	19.3	111.0	55.	40.	-10.
091200Z	16.4	114.3	80	16.7	114.2	65.	19.	-15.	18.0	113.2	70.	66.	-15.	20.2	111.0	60.	75.	-10.	22.2	110.5	45.	109.	-15.
091206Z	16.7	114.0	90	16.9	113.9	90.	13.	0.	18.5	112.0	95.	35.	15.	20.2	111.7	80.	49.	10.	22.1	110.0	65.	90.	5.
091212Z	17.0	113.8	90	17.0	113.7	90.	6.	0.	18.4	112.4	95.	24.	20.	20.1	111.3	80.	16.	15.	22.0	110.0	65.	119.	5.
091218Z	17.4	113.4	90	17.2	113.1	90.	21.	0.	18.2	111.7	95.	55.	20.	19.9	110.5	70.	36.	5.	21.9	110.2	60.	129.	5.
091300Z	17.7	113.2	85	17.6	112.8	85.	24.	0.	19.0	111.4	80.	45.	10.	20.0	110.0	70.	41.	10.	22.9	110.0	50.	179.	5.
091306Z	18.0	113.1	80	18.0	113.0	80.	6.	0.	18.8	112.0	75.	62.	5.	20.5	111.6	65.	115.	5.	0.0	0.0	0.	-0.	0.
091312Z	18.3	112.8	75	18.3	113.0	75.	11.	0.	19.9	112.1	65.	34.	0.	21.0	111.2	60.	137.	0.	0.0	0.0	0.	-0.	0.
091318Z	18.7	112.5	75	18.9	112.4	70.	13.	-5.	21.0	111.1	50.	54.	-15.	23.0	108.4	30.	83.	-25.	0.0	0.0	0.	-0.	0.
091400Z	19.0	112.2	70	19.1	112.2	70.	6.	0.	21.1	111.1	65.	66.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091406Z	19.4	111.9	70	19.3	111.9	70.	6.	0.	20.9	110.9	60.	73.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091412Z	19.9	111.5	65	20.0	111.7	65.	13.	0.	22.1	110.0	50.	121.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091418Z	20.1	111.1	65	20.3	111.3	65.	16.	0.	22.2	110.3	40.	137.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091500Z	20.4	110.2	60	20.6	110.2	60.	12.	0.	22.6	108.6	40.	101.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091506Z	20.9	109.6	60	20.8	109.5	60.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091512Z	21.3	108.8	60	21.5	108.8	60.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091518Z	21.7	107.9	55	21.7	107.9	55.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091600Z	21.8	107.0	45	21.8	107.0	45.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	13.	73.	110.	172.	13.	73.	110.	172.
AVG RIGHT ANGLE ERROR	9.	42.	72.	126.	9.	42.	72.	126.
AVG INTENSITY MAGNITUDE ERROR	2.	8.	11.	15.	2.	8.	11.	15.
AVG INTENSITY BIAS	0.	-2.	-6.	-8.	-0.	-2.	-6.	-8.
NUMBER OF FORECASTS	44	40	35	32	41	40	35	32

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1770. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 7. KNOTS

TYPHOON IRVING
FIX POSITIONS FOR CYCLONE NO. 10

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	050000	12.0N 132.6E	PCN 6			PGTW
2	050300	13.2N 132.0E	PCN 6			PGTW
3	050520	13.5N 132.6E	PCN 3	T1.0/1.0	INIT OBS	PGTW
4	050600	13.4N 132.5E	PCN 4			PGTW
5	050900	13.4N 132.2E	PCN 4			PGTW
6	051200	13.6N 131.7E	PCN 6			PGTW
7	051600	13.5N 130.0E	PCN 6			PGTW
* 8	051800	12.8N 130.3E	PCN 6			PGTW
* 9	052100	14.0N 128.9E	PCN 6			PGTW
10	060000	13.7N 128.7E	PCN 6			PGTW
11	060300	13.7N 128.4E	PCN 6	T2.5/2.5 /D1.5/21HRS		PGTW
12	060600	13.5N 127.8E	PCN 6			PGTW
13	060650	13.2N 128.0E	PCN 5	T2.0/2.0	INIT OBS	RPMK
14	060900	13.2N 127.7E	PCN 6			PGTW
15	061200	13.6N 127.9E	PCN 6		ULCC FIX	PGTW
16	061600	13.3N 127.6E	PCN 6		ULCC FIX	PGTW
17	061753	13.3N 127.5E	PCN 5			PGTW
18	062100	13.2N 127.3E	PCN 6			PGTW
19	070000	13.2N 127.0E	PCN 6			PGTW
20	070300	13.0N 126.6E	PCN 6	T3.5/3.5-/D1.0/24HRS		PGTW
21	070600	13.1N 126.4E	PCN 4			PGTW
22	070637	13.0N 126.5E	PCN 5	T3.5/3.5 /D1.5/24HRS		RPMK
23	070900	13.0N 126.2E	PCN 6			PGTW
24	071200	12.8N 126.1E	PCN 6			PGTW
25	071600	12.7N 125.4E	PCN 6			PGTW
26	071800	12.5N 125.2E	PCN 6		ULCC FIX	PGTW
27	071922	13.1N 125.1E	PCN 5		ULCC FIX	RODN
28	072100	12.9N 125.1E	PCN 6		ULCC FIX	PGTW
29	080000	13.2N 124.6E	PCN 6			PGTW
30	080300	13.1N 124.6E	PCN 6	T3.5/3.5 /S0.0/24HRS		PGTW
31	080626	13.2N 124.3E	PCN 5			PGTW
32	080626	13.1N 124.1E	PCN 3	T4.0/4.0-/D0.5/24HRS		RPMK
33	080900	13.1N 124.0E	PCN 6			PGTW
34	081200	13.1N 123.7E	PCN 6		ULCC FIX	PGTW
35	081600	13.2N 122.9E	PCN 6		ULCC FIX	PGTW
36	081800	13.3N 122.4E	PCN 6		ULCC FIX	PGTW
37	082100	13.0N 122.1E	PCN 6		ULCC FIX	PGTW
38	090000	13.6N 122.4E	PCN 6			PGTW
39	090300	13.9N 122.3E	PCN 6	T2.5/3.5+/W1.0/24HRS		PGTW
40	090613	14.3N 121.3E	PCN 5			PGTW
41	090613	14.2N 120.4E	PCN 3			RPMK
42	090900	14.1N 120.3E	PCN 6			PGTW
43	090900	14.2N 121.1E	PCN 4			RPMK
44	091200	14.6N 120.2E	PCN 6		ULCC FIX	PGTW
45	091600	15.0N 119.8E	PCN 6		ULCC FIX	PGTW
* 46	091800	15.4N 119.3E	PCN 6			PGTW
47	091858	15.1N 119.7E	PCN 5		ULCC FIX	RODN
* 48	091858	15.5N 119.0E	PCN 5		ULCC FIX	PGTW
49	092100	14.9N 119.7E	PCN 6		ULCC FIX BRKS CONTINUITY	PGTW
50	100000	14.9N 119.0E	PCN 4			PGTW
51	100300	15.3N 118.6E	PCN 6	T3.5/3.5 /D1.0/24HRS		PGTW
52	100601	15.4N 118.8E	PCN 5			PGTW
53	100601	15.1N 117.6E	PCN 5	T3.5/3.5 /D0.5/24HRS		RPMK
54	100900	15.3N 117.3E	PCN 6		ULCC FIX	PGTW
55	101200	15.5N 116.8E	PCN 6			PGTW
56	101600	15.3N 116.7E	PCN 6			PGTW
57	101800	15.1N 116.6E	PCN 6			PGTW
58	101846	15.0N 116.5E	PCN 5			PGTW
59	102100	15.2N 116.3E	PCN 6			PGTW
60	110000	15.5N 115.9E	PCN 6		ULCC FIX	PGTW
61	110300	15.7N 115.7E	PCN 4			PGTW
62	110600	15.8N 115.4E	PCN 2	T3.5/3.5 /S0.0/27HRS		PGTW
63	110900	15.8N 115.2E	PCN 4			PGTW
64	111200	15.9N 115.1E	PCN 4			PGTW
65	111600	16.0N 114.8E	PCN 4			PGTW
66	111800	16.3N 114.6E	PCN 4			PGTW
67	112100	16.4N 114.3E	PCN 4			PGTW
68	120000	16.6N 114.1E	PCN 4		ULCC FIX	PGTW
69	120300	16.7N 113.9E	PCN 4			PGTW
70	120600	16.7N 113.9E	PCN 1	T5.0/5.0-/D1.5/24HRS		PGTW
71	120719	16.8N 113.9E	PCN 1	T5.0/5.0 /D1.5/25HRS		RODN
72	120900	16.9N 113.7E	PCN 2			PGTW
73	121200	17.1N 113.5E	PCN 2			PGTW
74	121600	17.1N 113.2E	PCN 2			PGTW
75	121800	17.3N 113.1E	PCN 2			PGTW
76	122100	17.4N 113.0E	PCN 2			PGTW
77	130000	17.6N 113.0E	PCN 2			PGTW
78	130300	17.8N 113.1E	PCN 2	T4.0/4.5 /W1.0/21HRS		PGTW
79	130600	18.1N 112.9E	PCN 2			PGTW
80	130706	18.2N 113.1E	PCN 6	T4.5/5.0 /W0.5/24HRS		RODN
81	130900	18.3N 112.8E	PCN 6		ULCC FIX	PGTW
82	131200	18.5N 112.5E	PCN 6			PGTW
83	131600	18.8N 112.5E	PCN 6			PGTW
84	131800	18.8N 112.2E	PCN 6			PGTW

85	131951	18.7N 112.3E	PCN 1			RPMK
86	132100	18.9N 112.2E	PCN 6			PGTW
87	140000	19.1N 112.1E	PCN 4			PGTW
88	140300	19.2N 112.0E	PCN 2	T4.0/4.0-/S0.0/24HRS		PGTW
89	140600	19.7N 111.9E	PCN 2			PGTW
90	140655	19.8N 111.8E	PCN 1	T4.5/4.5-/S0.0/24HRS		RODN
91	140900	19.8N 111.7E	PCN 4			PGTW
92	141200	20.0N 111.5E	PCN 6		ULCC FIX	PGTW
93	141600	20.2N 111.4E	PCN 6			PGTW
94	141800	20.2N 111.1E	PCN 6			PGTW
95	141939	20.2N 110.5E	PCN 1			RPMK
96	142100	20.2N 110.6E	PCN 2			PGTW
97	150000	20.2N 110.2E	PCN 4			PGTW
98	150300	20.6N 109.9E	PCN 2	T3.5/4.0-/W0.5/24HRS		PGTW
99	150600	20.8N 109.6E	PCN 2			PGTW
100	150643	20.9N 109.4E	PCN 1	T3.5/4.5-/W1.0/24HRS		RODN
101	150643	20.9N 109.1E	PCN 1	T4.0/4.0-		RPMK
102	150900	21.4N 109.2E	PCN 2			PGTW
103	151200	21.6N 108.8E	PCN 2			PGTW
104	151600	21.5N 108.0E	PCN 4			PGTW
105	151800	21.4N 107.5E	PCN 4			PGTW
106	151927	21.7N 107.6E	PCN 4			RPMK
107	152100	21.6N 107.2E	PCN 4			PGTW
108	160000	21.8N 107.3E	PCN 6			PGTW
109	160631	22.6N 107.0E	PCN 3	T2.5/3.0-/W1.5/24HRS		RODN

AIRCRAFT FIXES

	FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
	1	050729	13.2N 132.0E	1500FT		999	35 240 52	230 23 250 40	5 3			+25 +22 34	1
*	2	052210	14.2N 129.9E	1500FT	3091	999	30 350 30	000 30 350 60	5 5			+14 +12 +11 32	2
	3	060715	13.5N 120.4E	700MB	3054		50 300 27	100 35 300 27	10 3				3
	4	060920	13.6N 120.4E	700MB	3040	1000	60 130 30	100 60 020 20	10 3			+11 + 0	3
	5	070722	13.0N 126.4E	700MB	2974		45 350 30	290 65 140 25	5 3			+15 +14 +11	5
	6	070947	13.0N 126.3E	700MB	2976		40 070 60	240 44 100 35	5 3			+17 +17 + 9	5
	7	071920	13.1N 125.5E	700MB	2945			030 49 270 30	5 5				6
	8	072205	13.1N 125.4E	700MB	2950	903	55 000 35	060 70 310 30	3 2	CIRCULAR	20	+13 +17	6
	9	092000	14.0N 119.4E	700MB	2990			060 59 310 0	5 2				7
	10	092306	14.0N 119.2E	700MB	3012		65 360 10	120 66 360 20	10 1			+12 +19 + 7	7
	11	100044	15.1N 117.0E	700MB	2940		40 360 60	070 50 350 30	3 3				8
	12	101043	15.2N 117.7E	700MB	2946	901	20 220 90	290 53 220 20	2 3	CIRCULAR	15	+12 +19 +12	8
	13	120623	16.0N 113.9E	700MB	2638	947	100 120 10	120 95 060 20	3 2	CIRCULAR	15	+17 +20 +12	10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	071800	13.1N 125.7E	LAND				1092/ 43203		14.0N 124.3E	98447
2	071900	13.1N 125.6E	LAND				10213 42005		14.0N 124.3E	98447
3	072000	13.2N 125.6E	LAND				10012 42004		14.0N 124.3E	98447
4	072100	13.2N 125.5E	LAND				10012 42000		14.0N 124.3E	98447
5	080600	13.3N 124.2E	LAND				25/00 4////		14.1N 123.0E	98440
6	082130	13.3N 122.6E	LAND				25/10 52706		14.1N 123.0E	98440
7	082200	13.4N 122.6E	LAND				20110 52904	EYE OPEN N	14.1N 123.0E	98440
8	090030	13.6N 122.0E	LAND				20021 50415	EYE OPEN NW	14.1N 123.0E	98443
9	090610	13.8N 121.6E	LAND				4//// /////		16.3N 120.6E	98321
10	090800	13.8N 121.4E	LAND				4//// 52906		16.3N 120.6E	98321
11	090830	14.2N 120.0E	LAND	FAIR					15.2N 120.5E	98327
12	090900	13.9N 121.3E	LAND				4//// 52900		16.3N 120.6E	98321
13	091000	14.0N 121.2E	LAND	GOOD				MVG WNW 4 KTS	13.8N 120.1E	
14	091200	14.3N 121.0E	LAND	GOOD				MVG WNW 4 KTS	13.8N 120.1E	
15	091315	14.4N 120.7E	LAND	GOOD	ELLIPTICAL			N TO S AXIS 37/20	16.6N 120.3E	
16	091400	14.3N 120.5E	LAND	GOOD	ELLIPTICAL			N TO S AXIS 24/14	16.6N 120.3E	
17	091500	14.2N 120.4E	LAND				4//// 63000		16.3N 120.6E	98321
18	091800	15.4N 119.7E	LAND				1091/ 42702		16.3N 120.6E	98321
19	092130	14.0N 119.2E	LAND				1072/ 43004	EYE 100 PCT CIR DIA 20NM	16.3N 120.6E	98321
20	092155	15.0N 119.2E	LAND	GOOD	ELLIPTICAL			N TO S AXIS 27/22	16.6N 120.3E	
21	092200	14.0N 119.1E	LAND				1072/ 42904	EYE 100 PCT CIR DIA 20NM	16.3N 120.6E	98321
22	092230	14.0N 119.1E	LAND				1072/ 42904	EYE 100 PCT CIR DIA 15NM	16.3N 120.6E	98321
23	092350	15.0N 119.0E	LAND	GOOD	CIRCULAR	32			16.6N 120.3E	
24	100000	14.9N 118.0E	LAND				1092/ 42703	EYE 100 PCT CIR DIA 30NM	16.3N 120.6E	98321
25	100100	14.9N 118.5E	LAND				1071/ 42706		16.3N 120.6E	98321
26	100200	14.9N 118.3E	LAND				1091/ 42905		16.3N 120.6E	98321
27	100300	15.0N 118.3E	LAND				1091/ 42905		16.3N 120.6E	98321
28	100400	15.0N 118.2E	LAND				1092/ 42003	EYE 90 PCT CIR DIA 32NM	16.3N 120.6E	98321
29	100430	14.9N 118.0E	LAND				1092/ 42600	EYE 90 PCT CIR	16.3N 120.6E	98321
30	100500	14.9N 117.9E	LAND				1072/ 42704	EYE 70 PCT CIR OPEN E	16.3N 120.6E	98321

31	100600	15.0N 117.7E	LAND	1072/ 43004	EYE 60 PCT CIR OPEN E	16.3N 120.6E	98321
32	100730	15.0N 117.7E	LAND	1071/ 40000		16.3N 120.6E	98321
33	100000	15.0N 117.5E	LAND	1077/ 41705		16.3N 120.6E	98321
34	101030	15.1N 117.2E	LAND	1071/ 43005		16.3N 120.6E	98321
35	112350	16.4N 114.1E	LAND	10603 52906		16.8N 112.3E	59981
36	120050	16.5N 114.1E	LAND	10732 43006		16.8N 112.3E	59981
37	120250	16.5N 114.0E	LAND	10413 53006		16.8N 112.3E	59981
38	120650	16.0N 11[illegible].0E	LAND	10512 53506		16.8N 112.3E	59981
39	120950	17.0N 1[illegible].7E	LAND	10512 53405		16.8N 112.3E	59981
40	121150	17.[illegible] 113.5E	LAND	10512 53405		16.8N 112.3E	59981
41	121250	17.3N 113.5E	LAND	10512 53405		16.8N 112.3E	59981
42	121350	17.3N 113.4E	LAND	10512 53405		16.8N 112.3E	59981
43	121450	17.4N 113.4E	LAND	10512 53405		16.8N 112.3E	59981
44	121550	17.4N 113.4E	LAND	10512 53403		16.8N 112.3E	59981
45	121650	17.5N 113.4E	LAND	10511 53405		16.8N 112.3E	59981
46	121750	17.4N 113.3E	LAND	10511 53405		16.8N 112.3E	59981
47	121850	17.5N 113.3E	LAND	10512 53304		16.8N 112.3E	59981
48	121950	17.5N 113.2E	LAND	10512 53304		16.8N 112.3E	59981
49	122150	17.6N 113.1E	LAND	11712 53304		16.8N 112.3E	59981
50	122250	17.6N 113.1E	LAND	10712 53302		16.8N 112.3E	59981
51	130050	17.7N 113.1E	LAND	10712 53302		16.8N 112.3E	59981
52	130550	18.0N 112.8E	LAND	30762 53405		16.8N 112.3E	59981
53	130650	18.1N 112.8E	LAND	30713 53405		16.8N 112.3E	59981
54	130850	18.3N 112.8E	LAND	30713 53405		16.8N 112.3E	59981
55	131150	18.5N 112.6E	LAND	3///3 53405		16.8N 112.3E	59981
56	131250	18.6N 112.6E	LAND	3///3 53405		16.8N 112.3E	59981
57	131450	18.7N 112.5E	LAND	3///3 53405		16.8N 112.3E	59981
58	131850	19.0N 112.3E	LAND	5///3 /////		16.8N 112.3E	59981
59	132200	18.8N 112.3E	LAND	10512 53104		20.0N 110.3E	59758

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	001200	13.0N 123.7E	055	015	WMO 98444
2	001800	13.1N 123.0E	055	050	WMO 98440
3	091200	14.0N 121.0E	050	025	WMO 98428
4	091800	14.5N 120.2E	050	025	WMO 98426
5	130000	17.8N 113.1E	085	075	WMO 59981
6	142100	20.4N 110.7E	060	030	WMO 59758
7	151800	21.7N 107.9E	055	045	WMO 59632

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON JUDY
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	WIND
090500Z	12.1	147.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090506Z	12.6	146.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090512Z	12.6	145.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090518Z	12.6	144.1	35	12.7	144.2	25.	0.	-10.	13.3	140.4	40.	113.	-10.	13.8	137.2	50.	197.	-15.	14.2	134.1	65.	381.	-15.
090600Z	12.9	143.5	40	12.8	143.2	40.	19.	0.	13.2	139.1	50.	160.	0.	14.0	135.1	60.	256.	-10.	15.2	131.0	70.	427.	-15.
090606Z	13.2	143.1	40	13.1	143.1	40.	6.	0.	13.6	140.5	50.	84.	-5.	14.4	136.0	65.	228.	-10.	14.9	133.1	75.	452.	-15.
090612Z	13.6	142.7	45	13.5	142.6	40.	8.	-5.	14.5	139.7	55.	78.	-5.	15.2	136.1	65.	246.	-10.	15.7	132.4	80.	461.	-5.
090618Z	14.0	142.2	50	13.8	142.2	50.	12.	0.	14.6	140.0	65.	144.	0.	15.3	136.0	75.	315.	-5.	15.3	133.0	85.	535.	0.
090700Z	14.5	141.5	50	14.4	141.6	50.	8.	0.	15.9	139.1	65.	109.	-5.	17.2	136.2	80.	266.	-5.	18.2	133.0	95.	393.	15.
090706Z	15.0	140.6	55	14.7	140.8	55.	21.	0.	16.2	138.0	70.	133.	-5.	18.2	134.8	85.	257.	-5.	19.2	130.7	100.	417.	20.
090712Z	15.8	139.7	60	15.7	140.0	55.	18.	-5.	17.9	136.8	75.	91.	0.	19.8	133.6	90.	210.	5.	21.0	130.8	110.	354.	35.
090718Z	16.7	138.8	65	16.7	139.2	60.	23.	-5.	19.2	135.7	80.	73.	0.	20.9	132.2	95.	215.	10.	22.7	129.5	115.	368.	40.
090800Z	17.3	137.9	70	17.4	137.8	60.	8.	-10.	19.7	133.8	85.	114.	0.	22.8	131.0	110.	195.	30.	25.4	129.8	115.	313.	40.
090806Z	18.2	137.0	75	18.1	136.9	65.	8.	-10.	20.6	133.4	90.	112.	0.	23.1	130.0	115.	227.	35.	25.8	129.7	95.	353.	20.
090812Z	19.3	136.2	75	18.8	136.1	70.	31.	-5.	21.6	133.1	95.	106.	10.	24.2	131.0	105.	211.	30.	26.8	129.8	95.	374.	20.
090818Z	20.4	135.5	80	20.5	135.3	75.	13.	-5.	24.0	133.3	95.	42.	10.	30.2	135.3	90.	224.	15.	33.3	142.9	80.	376.	5.
090900Z	21.4	134.7	85	21.8	134.5	90.	26.	5.	26.4	133.3	105.	100.	25.	33.4	137.0	70.	388.	-5.	0.0	0.0	0.	-0.	0.
090906Z	22.4	133.9	90	22.5	133.8	90.	8.	0.	27.0	133.4	90.	103.	10.	34.0	137.3	65.	379.	-10.	0.0	0.0	0.	-0.	0.
090912Z	23.3	133.6	85	23.4	133.4	90.	13.	5.	28.7	134.1	85.	169.	10.	36.1	139.2	60.	465.	-15.	0.0	0.0	0.	-0.	0.
090918Z	24.2	133.7	85	24.2	133.2	90.	27.	5.	29.7	134.6	65.	192.	-10.	38.0	141.3	40.	540.	-35.	0.0	0.0	0.	-0.	0.
091000Z	24.8	133.8	80	24.8	133.8	75.	0.	-5.	29.3	134.7	65.	136.	-10.	37.3	140.9	45.	403.	-30.	0.0	0.0	0.	-0.	0.
091006Z	25.4	134.1	80	25.7	133.8	75.	24.	-5.	31.4	135.0	60.	216.	-15.	39.2	143.8	40.	434.	-30.	0.0	0.0	0.	-0.	0.
091012Z	25.9	134.4	75	26.3	134.8	75.	32.	0.	31.8	136.2	60.	187.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091018Z	26.5	134.8	75	26.4	134.8	75.	6.	0.	30.1	137.6	70.	45.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091100Z	27.1	135.3	75	27.1	135.3	80.	0.	5.	31.0	138.5	70.	81.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091106Z	27.8	135.9	75	27.9	135.8	75.	0.	0.	32.7	139.2	60.	110.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091112Z	28.7	136.5	75	28.4	136.3	75.	21.	0.	32.8	139.7	60.	234.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091118Z	29.8	136.8	75	29.5	136.9	70.	19.	-5.	36.1	139.7	60.	284.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091200Z	31.4	137.0	75	31.7	137.2	70.	21.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091206Z	33.6	137.3	70	33.5	137.3	70.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091212Z	36.2	137.4	55	35.4	139.3	60.	104.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091218Z	39.5	139.5	40	40.0	140.0	45.	30.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	19.	125.	298.	401.	19.	125.	298.	401.
AVG RIGHT ANGLE ERROR	15.	73.	126.	262.	15.	73.	126.	262.
AVG INTENSITY MAGNITUDE ERROR	4.	8.	16.	19.	4.	8.	16.	19.
AVG INTENSITY BIAS	-2.	-8.	-3.	11.	-2.	-8.	-3.	11.
NUMBER OF FORECASTS	29	25	19	13	29	25	19	13

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2133. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TYPHOON JUDY
FIX POSITIONS FOR CYCLONE NO. 19

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	050000	12.1N 147.3E	PCN 6			PGTW
2	050300	12.3N 146.9E	PCN 6			PGTW
3	050520	12.5N 146.6E	PCN 5	T1.5/1.5	INIT OBS ULCC FIX	PGTW
4	050600	12.6N 146.5E	PCN 6			PGTW
5	050900	12.8N 146.3E	PCN 6			PGTW
6	051200	12.7N 145.5E	PCN 6			PGTW
7	051600	12.3N 144.2E	PCN 6			PGTW
8	051800	12.1N 143.5E	PCN 6			PGTW
9	052100	13.1N 143.6E	PCN 6			PGTW
10	060000	13.4N 143.3E	PCN 6			PGTW
11	060300	13.3N 143.1E	PCN 6	T2.5/2.5 /D1.0/21HRS		PGTW
12	060500	13.1N 142.8E	PCN 5			PGTW
13	060600	13.3N 142.7E	PCN 6			PGTW
14	060900	13.4N 142.5E	PCN 6			PGTW
15	061200	13.5N 142.5E	PCN 6			PGTW
16	061600	13.3N 141.6E	PCN 6		ULCC FIX	PGTW
17	061753	14.0N 141.9E	PCN 5		BRKS CONTINUITY	PGTW
18	062100	14.4N 141.8E	PCN 6			PGTW
19	070000	14.4N 141.4E	PCN 6			PGTW
20	070300	14.3N 141.1E	PCN 6	T3.5/3.5 /D1.0/24HRS		PGTW
21	070456	14.3N 140.9E	PCN 5			PGTW
22	070600	14.7N 140.7E	PCN 6			PGTW
* 23	070900	14.8N 140.5E	PCN 4			PGTW

24	071200	15.9N 139.9E	PCN 6			PGTW
25	071600	16.7N 139.2E	PCN 6			PGTW
26	071741	16.9N 138.7E	PCN 5		ULCC FIX	PGTW
27	071741	16.8N 138.6E	PCN 5			RODN
28	072100	17.5N 138.0E	PCN 6		ULCC FIX	PGTW
29	080000	17.5N 137.7E	PCN 6			PGTW
30	080300	17.7N 137.4E	PCN 6	T4.5/4.5 /D1.0/24HRS		PGTW
31	080444	17.9N 137.2E	PCN 5			PGTW
32	080600	17.9N 137.2E	PCN 6			PGTW
33	080900	18.3N 137.2E	PCN 6			PGTW
34	081200	19.4N 136.3E	PCN 6		ULCC FIX	PGTW
35	081600	19.7N 135.2E	PCN 6		ULCC FIX	PGTW
36	081720	20.4N 135.3E	PCN 6		ULCC FIX	PGTW
37	090000	21.9N 135.0E	PCN 6			PGTW
38	090300	21.9N 135.0E	PCN 6	T5.0/5.0 /D0.5/24HRS		PGTW
39	090613	22.4N 134.3E	PCN 5			PGTW
40	090900	22.9N 133.6E	PCN 4			PGTW
41	091200	23.1N 133.6E	PCN 4			PGTW
42	091600	23.7N 133.5E	PCN 4			PGTW
43	091800	23.8N 133.4E	PCN 4			PGTW
44	091858	24.1N 133.5E	PCN 4			PGTW
45	091858	24.1N 133.6E	PCN 5			RODN
46	092100	24.4N 133.6E	PCN 4			PGTW
47	100000	24.8N 133.7E	PCN 4		EXP LLCC	PGTW
48	100300	25.1N 133.8E	PCN 4	T5.0/5.0 /S0.0/24HRS		PGTW
49	100601	25.5N 134.0E	PCN 3			PGTW
50	100900	25.7N 134.3E	PCN 4			PGTW
51	101200	26.0N 134.6E	PCN 4			PGTW
52	101600	26.3N 134.8E	PCN 4			PGTW
53	101800	26.1N 134.8E	PCN 4			PGTW
54	101846	26.0N 135.0E	PCN 3			PGTW
55	102100	26.4N 135.2E	PCN 4			PGTW
56	110000	26.9N 135.2E	PCN 4			PGTW
57	110300	27.4N 135.3E	PCN 4			PGTW
58	110549	27.7N 135.7E	PCN 3	T4.0/4.5 /W1.0/27HRS		PGTW
59	110900	28.0N 135.8E	PCN 4			PGTW
60	111200	28.3N 136.3E	PCN 4			PGTW
61	111600	29.2N 136.8E	PCN 4			PGTW
62	111800	29.8N 136.9E	PCN 6			PGTW
63	111834	30.0N 137.1E	PCN 5			PGTW
64	112100	30.3N 137.6E	PCN 6			PGTW
65	120000	31.0N 137.5E	PCN 4		ULCC 31.3N 138.0E	PGTW
66	120300	32.3N 137.0E	PCN 4			PGTW
* 67	121800	41.1N 142.1E	PCN 5			PGTW
* 68	121810	41.1N 142.1E	PCN 5			RODN

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	ORIEN-TATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	052239	12.8N 143.7E	1500FT		994	45 100 15	270 41 190 25	8 3					+24	+23	31	1
2	060036	13.3N 142.8E	700MB	3009		35 020 50	020 35 320 90	3 5				+12	+13	+11		2
3	061107	13.6N 142.7E	700MB	3013			300 42 220 120	5 8								2
4	061801	14.1N 142.2E	700MB	2985			110 52 060 40	9 5								3
5	062100	14.3N 141.0E	700MB	2987		50 130 45	210 47 130 30	9 7				+12	+15	+ 9		3
6	070623	15.2N 140.5E	700MB	2964		60 100 40	230 53 120 100	5 4								4
7	070843	15.5N 140.2E	700MB			50 220 60	140 67 040 90	5 3				+12	+14	+10		4
8	072059	17.1N 138.2E	700MB	2906	970	45 100 30	220 46 120 80	8 10	ELLIPTICAL	40 20	140	+15	+15	+14		5
9	080607	18.2N 136.8E	700MB	2832		70 100 90	180 84 100 75	10 5					+16	+12		7
10	080902	18.7N 136.0E	700MB	2814	968	50 200 60	140 69 030 40	10 10	CIRCULAR	25		+12	+15	+14		7
11	081805	20.6N 135.2E	700MB	2743			150 82 700 40	5 3								8
12	082034	21.0N 135.0E	700MB	2706		70 210 15	300 80 190 20	5 3	ELLIPTICAL	40 30	090	+20	+19	+11		8
13	090600	22.5N 133.7E	700MB	2729		60 020 60	200 85 120 65	8 5								10
14	090840	22.8N 133.6E	700MB	2730	959	55 300 75	200 67 200 60	5 5					+17			10
15	092102	24.3N 133.8E	700MB	2777	965	50 020 70	160 73 080 90	10 3				+15	+13	+13		11
16	092316	24.7N 133.7E	700MB	2791		60 320 80	020 77 310 70	10 3								11
17	101230	25.9N 134.4E	700MB	2793	967		130 71 050 65	15 10				+12	+15	+15		12
18	101509	26.2N 134.4E	700MB	2786			350 75 250 75	10 9				+15	+16	+15		12
19	102207	26.8N 135.2E	700MB	2787	966	55 220 90	300 87 210 65	10 2				+15	+16	+14		13
20	102311	26.8N 135.2E	700MB	2787		65 300 60	360 65 200 100	5 2								13
21	110322	27.4N 135.3E	700MB	2800		60 300 90	220 70 130 120	5 5				+15	+16	+15		14
22	110622	27.8N 135.9E	700MB	2798		60 360 120	140 64 030 120	5 5								14
23	110818	28.0N 136.0E	700MB	2798	966	65 240 90	230 70 240 80	5 5				+15	+15	+15		14
24	112219	30.9N 136.7E	700MB	2803	967	70 130 100	160 82 040 120	4 1				+18	+16	+12		16
25	120203	32.1N 136.9E	700MB	2776	964	75 270 80	300 66 200 30	2 10				+10	+15	+13		16
26	120701	34.0N 137.3E	700MB	2775	973	75 090 40	240 80 130 40	3 3				+ 8	+15	+11		17

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	051035	13.0N 143.8E	LAND	POOR					13.6N 144.9E	91210
2	052035	13.0N 143.6E	LAND	POOR					13.6N 144.9E	91210
3	060035	13.5N 143.2E	LAND	FAIR					13.6N 144.9E	91210
4	060135	13.6N 143.2E	LAND	FAIR					13.6N 144.9E	91210
5	060235	13.6N 143.2E	LAND	FAIR					13.6N 144.9E	91210
6	120000	34.3N 137.9E	LAND				6//// 5////		34.6N 135.7E	47773
7	120000	34.5N 137.6E	LAND				6//// 4////		35.2N 137.0E	47636
8	120000	34.4N 137.6E	LAND				227/5 53132		35.3N 138.7E	47639
9	120900	34.9N 138.1E	LAND				5///5 73619		35.3N 138.7E	47639
10	121000	35.3N 138.4E	LAND				5///5 70124		35.3N 138.7E	47639

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	120600	33.9N 138.1E	060	065	WMO 47665
2	120900	34.9N 138.4E	055	025	WMO 47696
3	121200	36.3N 138.3E	050	050	WMO 47604
4	121500	37.7N 138.8E	045	020	WMO 47604
5	121800	39.5N 139.5E	040	025	WMO 47582

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON KEN
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
091600Z	17.5	133.7	30	17.8	132.9	30.	49.	0.	18.7	129.9	40.	42.	-5.	19.2	126.4	45.	109.	-45.	19.5	121.3	55.	268.	-55.
091606Z	17.7	132.3	30	17.8	132.2	30.	8.	0.	18.7	129.1	40.	51.	-10.	19.2	125.2	50.	140.	-50.	19.5	120.0	60.	306.	-40.
091612Z	17.8	131.8	35	17.8	131.8	35.	0.	0.	17.9	129.5	45.	72.	-20.	17.8	126.6	50.	146.	-50.	17.2	123.2	60.	231.	-40.
091618Z	18.1	131.1	40	17.9	131.0	35.	13.	-5.	18.1	127.9	45.	95.	-40.	17.9	124.5	55.	187.	-45.	17.5	120.8	50.	289.	-50.
091700Z	18.3	130.5	45	18.0	130.8	40.	25.	-5.	18.2	128.4	50.	78.	-40.	18.1	125.4	60.	153.	-50.	18.5	122.0	65.	190.	-35.
091706Z	18.7	130.0	50	18.6	129.9	50.	8.	0.	19.2	127.0	60.	49.	-40.	19.5	124.1	65.	95.	-35.	19.8	120.8	65.	197.	-40.
091712Z	19.1	129.6	65	18.9	129.5	50.	13.	-15.	19.8	126.7	60.	29.	-40.	19.8	123.8	65.	82.	-35.	19.5	120.4	65.	237.	-40.
091718Z	19.2	129.1	85	19.0	128.8	80.	21.	-5.	19.2	125.8	95.	80.	-5.	19.0	122.8	100.	144.	0.	18.5	119.4	100.	318.	0.
091800Z	19.5	128.3	90	19.6	128.5	90.	13.	0.	20.4	125.8	100.	13.	-10.	20.7	122.8	115.	84.	15.	21.2	119.4	85.	297.	-10.
091806Z	19.8	127.6	100	20.0	127.8	95.	16.	-5.	21.0	124.9	105.	33.	5.	21.2	121.8	115.	130.	10.	21.3	118.4	85.	358.	-5.
091812Z	20.2	127.0	100	20.2	126.9	100.	6.	0.	20.8	124.8	110.	8.	10.	21.1	122.6	115.	95.	10.	21.1	120.1	90.	269.	5.
091818Z	20.3	126.6	100	20.2	126.3	100.	18.	0.	20.7	124.3	110.	17.	10.	21.0	122.2	110.	118.	10.	21.0	119.5	85.	300.	5.
091900Z	20.6	125.9	110	20.8	126.0	105.	13.	-5.	21.6	124.2	110.	48.	10.	21.8	122.1	100.	151.	5.	22.1	119.8	80.	300.	5.
091906Z	20.6	125.3	100	20.8	125.3	105.	12.	5.	21.3	123.2	110.	56.	5.	21.9	120.5	90.	244.	0.	21.8	117.7	80.	447.	5.
091912Z	20.7	124.9	100	20.6	124.8	105.	8.	5.	21.2	123.0	105.	74.	0.	21.8	121.0	90.	219.	5.	21.9	118.4	75.	437.	0.
091918Z	20.7	124.6	100	20.8	124.2	105.	23.	5.	21.4	122.1	105.	124.	5.	22.4	119.8	75.	280.	-5.	24.5	117.7	45.	507.	-30.
092000Z	20.8	124.3	100	21.0	124.1	105.	16.	5.	22.4	122.3	110.	155.	15.	24.7	121.9	90.	236.	15.	27.4	122.4	85.	331.	20.
092006Z	20.9	124.1	105	21.2	123.9	110.	21.	5.	22.3	123.5	110.	98.	20.	24.8	122.2	95.	233.	20.	27.7	123.7	85.	307.	15.
092012Z	21.0	124.3	105	21.0	124.0	110.	17.	5.	22.2	123.6	110.	87.	25.	24.5	123.7	90.	164.	15.	27.8	125.2	80.	249.	10.
092018Z	21.1	124.3	100	21.0	124.0	110.	18.	10.	22.2	123.6	110.	71.	30.	24.5	123.7	90.	183.	15.	27.8	125.2	80.	273.	5.
092100Z	21.1	124.7	95	21.0	124.8	90.	8.	-5.	21.8	124.5	90.	46.	15.	23.2	124.4	90.	175.	25.	25.8	124.8	85.	331.	5.
092106Z	21.2	124.8	90	21.2	124.6	90.	11.	0.	21.9	124.5	90.	79.	15.	24.2	124.5	90.	216.	20.	27.3	124.7	85.	360.	15.
092112Z	21.4	124.9	85	21.8	124.8	90.	25.	5.	23.2	125.2	80.	56.	5.	25.6	125.1	70.	222.	0.	28.8	125.0	60.	396.	-10.
092118Z	21.8	124.8	80	21.6	124.8	85.	12.	5.	22.2	124.7	80.	148.	5.	23.8	124.2	70.	372.	-5.	26.0	123.4	60.	645.	-5.
092200Z	22.2	125.2	75	22.2	125.1	75.	6.	0.	23.8	125.5	70.	107.	5.	25.2	124.6	65.	355.	-15.	26.4	122.3	60.	756.	15.
092206Z	22.6	125.7	75	22.7	125.4	70.	18.	-5.	24.7	126.2	50.	120.	-20.	27.0	125.4	35.	332.	-35.	0.0	0.0	0.	-0.	0.
092212Z	23.0	126.2	75	23.2	126.2	70.	12.	-5.	25.7	127.6	55.	87.	-15.	27.8	128.0	45.	296.	-25.	0.0	0.0	0.	-0.	0.
092218Z	23.6	126.9	75	23.5	126.6	70.	18.	-5.	25.5	128.0	50.	142.	-25.	28.2	128.8	40.	361.	-25.	0.0	0.0	0.	-0.	0.
092300Z	24.2	127.4	65	24.1	127.5	65.	8.	0.	27.2	130.1	50.	40.	-30.	30.2	132.1	40.	319.	-5.	0.0	0.0	0.	-0.	0.
092306Z	24.8	128.4	70	24.7	128.2	65.	12.	-5.	27.5	130.7	50.	100.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092312Z	25.7	129.2	70	25.9	129.5	70.	20.	0.	31.9	133.5	50.	83.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092318Z	26.8	130.2	75	26.8	130.2	65.	0.	-10.	32.8	134.0	50.	81.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092400Z	27.7	130.6	80	28.0	130.5	70.	19.	-10.	33.7	133.4	45.	117.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092406Z	29.1	131.2	70	28.9	131.1	70.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092412Z	31.2	132.1	70	30.8	132.2	70.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092418Z	33.3	132.5	65	33.6	132.8	70.	23.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092500Z	35.5	132.5	45	35.7	132.7	45.	15.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	15.	75.	201.	344.	14.	75.	201.	344.
AVG RIGHT ANGLE ERROR	9.	49.	134.	263.	9.	49.	134.	263.
AVG INTENSITY MAGNITUDE ERROR	4.	16.	20.	19.	4.	16.	20.	19.
AVG INTENSITY BIAS	-1.	-5.	-9.	-10.	-1.	-5.	-9.	-10.
NUMBER OF FORECASTS	37	33	29	25	35	33	29	25

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1647. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 8. KNOTS

TYPHOON KEN
FIX POSITIONS FOR CYCLONE NO. 20

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	150600	16.1N 134.4E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	151746	17.6N 134.6E	PCN 5		BASED ON EXTRAP	PGTW
3	160000	17.4N 132.7E	PCN 6		BASED ON EXTRAP	PGTW
4	160300	17.4N 132.3E	PCN 6	T2.0/2.0 /D1.0/21HRS		PGTW
5	160600	17.7N 132.0E	PCN 6		BASED ON EXTRAP	PGTW
6	160631	17.5N 131.9E	PCN 5	T1.5/1.5	INIT OBS	RPMK
7	160900	17.7N 132.3E	PCN 6			PGTW
8	161200	17.9N 132.5E	PCN 6		ULCC FIX	PGTW
9	161600	17.9N 131.1E	PCN 6		ULCC FIX	PGTW
10	161733	18.0N 131.0E	PCN 5		ULCC FIX	PGTW
11	161800	17.8N 130.9E	PCN 6		ULCC FIX	PGTW
12	162100	17.9N 130.8E	PCN 6		ULCC FIX	PGTW
13	170000	18.2N 130.6E	PCN 6		BASED ON EXTRAP	PGTW
14	170600	18.0N 129.4E	PCN 6	T3.0/3.0 /D1.0/27HRS		PGTW
15	170618	18.6N 130.1E	PCN 5			RPMK
16	170900	18.8N 129.3E	PCN 6			PGTW
17	171200	18.9N 129.6E	PCN 6			PGTW
18	171600	18.9N 129.0E	PCN 6			PGTW
19	171800	19.2N 128.8E	PCN 2			PGTW
20	172100	19.5N 128.6E	PCN 2			PGTW
21	180000	19.7N 128.4E	PCN 2			PGTW
22	180300	19.8N 127.9E	PCN 2	T4.5/4.5 /D1.5/21HRS		PGTW
23	180600	20.0N 127.4E	PCN 1			PGTW
24	180900	20.1N 127.2E	PCN 2			PGTW
25	181200	20.1N 127.0E	PCN 2			PGTW
26	181600	20.1N 126.7E	PCN 4			PGTW
27	181800	20.1N 126.5E	PCN 4			PGTW
28	190000	20.5N 125.8E	PCN 2			PGTW
29	190300	20.5N 125.6E	PCN 4	T5.0/5.0 /D0.5/24HRS		PGTW
30	190554	20.5N 125.1E	PCN 1	T5.5/5.5	INIT OBS	RODN
31	190600	20.4N 125.2E	PCN 4			PGTW
32	190900	20.5N 125.0E	PCN 4			PGTW
33	191200	20.7N 124.8E	PCN 4			PGTW
34	191600	20.7N 124.5E	PCN 4			PGTW
35	191800	20.8N 124.5E	PCN 4			PGTW
36	191839	20.9N 124.6E	PCN 1			RODN
37	192100	21.0N 124.5E	PCN 4			PGTW
38	200000	20.8N 124.2E	PCN 2			PGTW
39	200300	21.0N 124.1E	PCN 2	T5.5/5.5 /D0.5/24HRS		PGTW
40	200542	20.9N 124.2E	PCN 1	T6.0/6.0	INIT OBS	RPMK
41	200600	21.0N 124.0E	PCN 2			PGTW
42	200900	21.0N [illegible]	PCN 2			PGTW
43	201200	21.0N [illegible]	PCN 2			PGTW
44	201600	20.8N 124.3E	PCN 2			PGTW
45	201800	20.8N 124.3E	PCN 2			PGTW
46	202100	21.1N 124.4E	PCN 2			PGTW
47	210000	20.9N 124.6E	PCN 4			PGTW
48	210300	21.2N 124.6E	PCN 4	T5.0/5.5+/W0.5/24HRS		PGTW
49	210600	21.6N 124.8E	PCN 4			PGTW
50	210900	21.8N 124.9E	PCN 4			PGTW
51	211200	21.7N 124.9E	PCN 4			PGTW
52	211600	21.6N 124.8E	PCN 4			PGTW
53	211800	21.6N 125.0E	PCN 4			PGTW
54	212100	21.6N 125.2E	PCN 4			PGTW
55	220000	22.1N 125.3E	PCN 4		ULCC FIX	PGTW
56	220300	22.4N 125.4E	PCN 4			PGTW
57	220518	22.5N 125.6E	PCN 3			PGTW
58	220600	22.5N 125.8E	PCN 4	T4.0/4.5 /W1.0/27HRS		PGTW
59	220700	22.6N 125.7E	PCN 3	T4.5/4.5	INIT OBS	RPMK
60	220900	22.9N 126.0E	PCN 4			PGTW
61	221200	23.0N 126.1E	PCN 4		EXP LLCC	PGTW
62	221600	23.2N 126.3E	PCN 4			PGTW
63	221803	23.3N 126.5E	PCN 3			PGTW
64	222100	23.6N 127.3E	PCN 4			PGTW
65	230000	24.1N 127.3E	PCN 4			PGTW
66	230300	24.4N 127.5E	PCN 4			PGTW
67	230506	24.7N 128.0E	PCN 3			PGTW
68	230600	24.9N 128.3E	PCN 4	T4.0/4.0-/S0.0/24HRS		PGTW
69	230640	24.8N 128.5E	PCN 3	T4.5/4.5 /S0.0/24HRS		RPMK
70	230900	25.4N 128.8E	PCN 4			PGTW
71	231200	25.8N 129.3E	PCN 4			PGTW
72	231600	26.4N 129.9E	PCN 4		EXP LLCC	PGTW
73	231751	26.7N 130.1E	PCN 3		EXP LLCC	PGTW
74	232100	27.2N 130.5E	PCN 4			PGTW
75	240000	27.7N 130.9E	PCN 4			PGTW
76	240300	28.0N 131.0E	PCN 4			PGTW
77	240453	29.3N 131.4E	PCN 1	T4.0/4.0 /W0.5/22HRS		RPMK
78	240600	29.0N 131.5E	PCN 4	T4.0/4.0-/S0.0/24HRS		PGTW
79	240900	30.0N 132.3E	PCN 4			PGTW
80	241200	31.0N 132.5E	PCN 4			PGTW
81	241600	32.9N 132.6E	PCN 4			PGTW
82	241730	33.2N 132.6E	PCN 3		ULCC FIX	PGTW
83	241930	33.8N 134.2E	PCN 5	T4.0/4.5 /W0.5/24HRS		RPMK
84	242100	35.3N 132.4E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	160014	17.7N 132.7E	1500FT		1003	35 050 65	060 29 340 45	8 15			+24 +25 +24	1
2	160055	17.8N 132.2E	700MB	3056	999	35 020 35	120 35 030 120	5 3			+10 +22 +22 20	2
3	170023	18.4N 130.4E	700MB	3000		45 340 11	240 30 150 15	12 10			+12 +16 +14	3
4	170646	18.8N 130.0E	700MB	2920		50 270 10	190 51 090 15	2 2	CIRCULAR	25	+13 +14 +11	4
5	170837	18.9N 129.8E	700MB	2984	976	45 310 50	030 46 310 50	3 2	CIRCULAR	25	+10 +14 +10	4
6	171906	19.3N 129.0E	700MB	2720			120 80 010 10	12 1	CIRCULAR	15	+12 +16 +12	5
7	172100	19.4N 128.7E	700MB	2667	952	100 260 10	050 92 000 8	8 1	CIRCULAR	10	+11 +17 + 8	5
8	180600	19.9N 127.4E	700MB	2566	938	100 240 7	230 80 160 8	10 3	CIRCULAR	10		6
9	180840	20.0N 127.3E	700MB	2584		100 010 6	000 84 360 10	10 2	ELLIPTICAL	10 07 120	+11 +18 +12	6
10	182003	20.0N 126.2E	700MB	2632			260 98 140 60	10 5				7
11	182249	20.6N 126.2E	700MB	2725	956	110 360 10	050 57 310 60	4 2	CIRCULAR	15	+20 +23 +10	7
12	190613	20.6N 125.2E	700MB	2662		100 150 10	260 89 160 20	7 3	CIRCULAR	35	+10 +17 +14	8
13	190856	20.6N 125.1E	700MB	2644	947	100 360 12	350 80 260 40	5 1	CIRCULAR	40	+16 +16 +14	8
14	192201	20.8N 124.4E	700MB	2590		65 000 100	090 93 360 20	10 2	CIRCULAR	30	+16 +17 +13	9
15	192259	20.8N 124.4E	700MB	2597	942		350 85 270 41	10 2				9
16	200623	21.0N 124.1E	700MB	2544	936	65 070 60	270 76 170 34	10 3	CIRCULAR	15		10
17	200902	21.0N 124.2E	700MB	2556		60 260 80	060 85 340 27	10 4	CIRCULAR	18	+14 +19 +14	10
18	202030	21.2N 124.3E	700MB	2654			300 70 220 50	3 2	ELLIPTICAL	15 8 150		11
19	202307	21.0N 124.7E	700MB	2673	954	60 360 20	360 80 260 50	3 2			+12 +15 +15	11
20	210920	21.5N 124.8E	700MB	2681		60 200 100	200 69 200 80	7 1	CIRCULAR	5	+11 +12 +12	12
21	211206	21.3N 124.8E	700MB	2720			080 73 360 43	7 1	CIRCULAR	8	+10 +10 +10	12
22	212011	21.9N 124.8E	700MB	2760			210 76 140 85	15 2	CIRCULAR	7		14
23	212327	22.2N 125.2E	700MB	2789	960	60 300 100	020 65 300 95	15 5			+11 +11 +10	14
24	220704	22.7N 125.8E	700MB	2795		70 220 70	210 79 120 65	5 5				15
25	220947	22.8N 126.0E	700MB	2793		55 360 03	360 68 260 95	5 5			+10 +12 +12	15
26	222056	23.8N 127.4E	700MB	2807		60 100 120	190 84 100 70	3 6				16
27	222317	24.0N 127.5E	700MB	2811		70 240 120	330 70 230 40	3 10			+11 +14 +13	16
28	231028	25.6N 129.1E	700MB	2771	964		200 88 220 100	7 3			+12 +18	17
29	231218	25.7N 129.2E	700MB	2732			310 80 200 45	7 3				17
30	232223	27.5N 130.3E	700MB	2824	970	80 210 60	240 85 120 90	3 5			+13 +15 +12	18
31	240104	27.9N 130.7E	700MB	2854		55 300 120	130 70 030 103	3 3			+13 +14 +13	18
32	240938	30.4N 132.0E	700MB	2858	973	70 220 92	230 90 130 65	5 5			+11 +13 +12	19
33	241159	31.1N 132.1E	700MB	2859			150 86 020 60	5 10				19

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	191200	20.2N 124.9E	LAND				359/4 70000		20.4N 122.0E	98136
2	191300	20.2N 124.9E	LAND				359/4 40000		20.4N 122.0E	98136
3	200900	20.8N 124.2E	LAND				15/// 63506		20.4N 122.0E	98136
4	210400	21.0N 124.4E	LAND				354/3 4////		20.4N 122.0E	98136
5	211200	21.3N 124.3E	LAND				353/3 50000		20.4N 122.0E	98136
6	220200	22.3N 125.4E	LAND				6///4 5////		24.8N 125.2E	47927
7	221500	23.3N 126.6E	LAND				///// /////		26.2N 127.8E	47937
8	221700	23.6N 126.7E	6				6//// 50400		26.2N 127.8E	47937
9	222100	23.9N 127.1E	LAND				6594/ 70500		26.2N 127.8E	47937
10	222200	24.0N 127.2E	LAND				6591/ 70609		26.2N 127.8E	47937
11	222300	24.1N 127.3E	LAND				6591/ 70109		26.2N 127.8E	47937
12	230000	24.2N 127.4E	LAND				65/1/ 70500		26.2N 127.8E	47937
13	230100	24.1N 127.8E	LAND				20972 70710		26.2N 127.8E	47937
14	230300	24.6N 127.9E	LAND				21912 70512		26.2N 127.8E	47937
15	230400	24.6N 128.1E	LAND				20912 70412		26.2N 127.8E	47937
16	230500	24.7N 128.4E	LAND				21912 70613		26.2N 127.8E	47937
17	230600	24.8N 128.5E	LAND				21942 70612		26.2N 127.8E	47937
18	232000	27.1N 130.1E	LAND				65/// 50211		28.4N 129.5E	47909
19	232000	26.9N 130.4E	LAND				65913 70114		26.2N 127.8E	47937
20	232100	27.3N 130.3E	LAND				65/// 50316		28.4N 129.5E	47909
21	232100	27.3N 130.7E	LAND				65/// 70216		26.2N 127.8E	47937
22	232200	27.4N 130.5E	LAND				65/// 50513		28.4N 129.5E	47909
23	232200	27.4N 130.8E	LAND				65/1/ 70416		26.2N 127.8E	47937
24	232300	27.6N 130.5E	LAND				5191/ 53613		28.4N 129.5E	47909
25	232300	27.7N 130.9E	LAND				65//3 70316		26.2N 127.8E	47937
26	240000	27.6N 130.6E	LAND				50913 50500		28.4N 129.5E	47909
27	240100	27.8N 130.7E	LAND				50913 50413		28.4N 129.5E	47909
28	240300	28.2N 131.0E	LAND				51912 50219		28.4N 129.5E	47909
29	240400	28.4N 131.0E	LAND				51912 50213		28.4N 129.5E	47909
30	240500	28.6N 131.1E	LAND				51912 50213		28.4N 129.5E	47909
31	240600	28.7N 131.2E	LAND				55/42 50311		28.4N 129.5E	47909
32	242300	35.0N 132.4E	LAND				55/// 53424		35.5N 133.1E	47791

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	231500	26.6N 130.1E	065	000	WMO 47945
2	241800	33.2N 132.5E	065	050	WMO 478908
3	242100	34.0N 132.6E	045	020	WMO 47765, WMO 47890, WMO 47887

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM LOLA
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
091500Z	22.0	160.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091506Z	22.7	166.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091512Z	23.3	165.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091518Z	24.0	164.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091600Z	24.5	163.5	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091606Z	25.1	162.3	35	25.2	162.3	30.	6.	-5.	28.5	158.2	45.	52.	-5.	33.2	159.1	55.	105.	10.	0.0	0.0	0.	-0.	0.
091612Z	25.6	161.3	40	25.6	161.3	30.	0.	-10.	28.6	158.2	45.	34.	-5.	33.2	159.1	55.	211.	10.	0.0	0.0	0.	-0.	0.
091618Z	26.2	160.3	45	26.2	160.3	30.	0.	-15.	29.7	158.0	45.	40.	0.	34.5	160.0	50.	322.	5.	0.0	0.0	0.	-0.	0.
091700Z	26.9	159.5	45	27.5	159.3	35.	30.	-10.	33.7	160.2	50.	152.	5.	40.0	172.3	40.	209.	0.	0.0	0.0	0.	-0.	0.
091706Z	27.9	158.9	50	28.5	159.0	45.	36.	-5.	35.5	162.2	45.	190.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091712Z	28.8	158.8	50	28.6	159.2	50.	24.	0.	35.0	162.0	45.	93.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091718Z	29.9	158.9	45	30.0	159.3	45.	22.	0.	35.0	166.6	45.	90.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091800Z	31.2	159.7	45	31.4	160.5	50.	43.	5.	36.2	170.3	40.	43.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091806Z	32.5	161.0	45	32.2	161.2	45.	21.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091812Z	33.5	163.3	45	33.7	163.1	45.	16.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091818Z	34.3	166.5	45	34.2	166.3	45.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091900Z	35.5	170.1	40	35.0	170.0	40.	30.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	9.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	21.	88.	232.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	14.	68.	152.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	4.	2.	6.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-3.	-1.	6.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	12	8	4	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1424. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 15. KNOTS

TROPICAL STORM LOLA
FIX POSITIONS FOR CYCLONE NO. 21

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	150318	22.5N	167.9E	PCN 6	T1.5/1.5	INIT OBS ULCC FIX	KGWC
2	151603	24.1N	164.5E	PCN 6		ULCC FIX	KGWC
3	151604	24.1N	164.3E	PCN 6			PGTW
4	152100	24.4N	163.9E	PCN 6		ULCC FIX	PGTW
5	160000	24.2N	163.4E	PCN 6	T2.0/2.0	INIT OBS	PGTW
6	160300	24.0N	162.8E	PCN 6			PGTW
7	160600	25.2N	162.3E	PCN 6			PGTW
8	160900	25.0N	161.7E	PCN 6			PGTW
9	161600	26.0N	161.0E	PCN 6			PGTW
10	161800	26.2N	160.0E	PCN 6			PGTW
11	162100	26.0N	159.8E	PCN 6			PGTW
12	170000	26.0N	159.5E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
13	170436	27.0N	158.9E	PCN 6			PGTW
14	170600	27.0N	158.9E	PCN 6			PGTW
15	170900	28.1N	159.4E	PCN 6			PGTW
16	171200	28.7N	159.1E	PCN 6		ULCC FIX	PGTW
17	171600	29.5N	159.2E	PCN 6			PGTW
18	171800	30.3N	159.6E	PCN 6			PGTW
19	172100	30.0N	159.9E	PCN 6			PGTW
20	180000	30.9N	159.4E	PCN 4	T3.0/3.0 /S0.0/24HRS		PGTW
21	180424	31.9N	160.0E	PCN 3			PGTW
22	180600	32.4N	161.2E	PCN 4			PGTW
23	180900	32.0N	162.2E	PCN 6			PGTW
24	181200	33.3N	162.9E	PCN 6			PGTW
25	181600	33.5N	165.5E	PCN 6			PGTW
26	181800	34.1N	166.3E	PCN 6			PGTW
27	182100	34.5N	168.1E	PCN 6			PGTW
28	190000	36.0N	170.9E	PCN 6	T2.0/2.5 /W1.0/24HRS		PGTW

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 22
BEST TRACK DATA

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
MO/DA/HR	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
092106Z	18.6 139.3	30	18.2 139.5	30.	27.	0.	19.6 136.9	40.	155.	15.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
092112Z	19.8 138.8	30	18.9 139.5	30.	67.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
092118Z	20.7 137.8	30	21.0 138.5	30.	43.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
092200Z	21.2 136.8	30	21.4 136.6	30.	16.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
092206Z	22.1 136.2	25	22.3 135.9	20.	21.	-5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	35.	155.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	21.	83.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	1.	15.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-1.	15.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	1	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 282. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

TROPICAL DEPRESSION TD22
FIX POSITIONS FOR CYCLONE NO. 22

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	210000	17.4N 139.8E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	210300	18.1N 139.0E	PCN 4			PGTW
3	210600	18.4N 140.0E	PCN 4			PGTW
4	210900	18.8N 140.8E	PCN 4			PGTW
5	211200	19.5N 139.4E	PCN 6			PGTW
6	211600	21.2N 138.0E	PCN 6			PGTW
* 7	211800	21.0N 139.5E	PCN 6			PGTW
* 8	212100	21.4N 138.7E	PCN 6			PGTW
9	220000	21.2N 137.0E	PCN 6	T1.0/1.0 /S0.0/24HRS		PGTW
10	220300	21.2N 136.7E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	200813	16.7N 140.5E	1500FT		1002	25 110 30	020 22 200 50	12 12			+27 +25 25	1
2	212236	21.1N 136.9E	1500FT		1003	20 240 30	250 10 360 10	12 5			+25 +25 +25 27	2

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON MAC
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100100Z	11.0	151.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100106Z	11.9	151.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100112Z	12.0	150.2	25	12.6	150.2	25.	36.	0.	13.3	147.3	35.	67.	-10.	14.0	144.3	45.	84.	-40.	14.0	141.4	55.	113.	-70.
100118Z	12.0	149.4	30	12.4	149.1	30.	30.	0.	13.0	145.6	45.	27.	-5.	13.4	142.8	55.	59.	-35.	13.8	139.8	65.	123.	-65.
100200Z	12.1	148.5	30	11.9	148.5	30.	12.	0.	12.2	146.3	45.	118.	-15.	12.7	144.5	55.	211.	-45.	13.6	143.2	65.	321.	-75.
100206Z	12.5	147.5	40	12.4	147.5	40.	6.	0.	13.4	143.0	50.	0.	-20.	14.9	141.8	60.	70.	-50.	17.0	140.6	70.	174.	-65.
100212Z	12.6	146.4	45	12.8	146.5	40.	13.	-5.	13.8	143.2	55.	18.	-30.	15.5	141.1	65.	65.	-60.	18.2	138.0	80.	91.	-50.
100218Z	12.6	145.4	50	12.9	145.4	45.	10.	-5.	14.3	142.4	65.	13.	-25.	16.0	140.0	90.	60.	-40.	17.2	136.1	115.	44.	-10.
100300Z	13.1	144.5	60	12.8	144.7	55.	21.	-5.	13.2	141.6	75.	79.	-25.	13.8	138.2	95.	138.	-45.	14.5	134.3	105.	265.	-10.
100306Z	13.3	143.7	70	13.3	143.7	70.	0.	0.	14.0	139.0	110.	76.	0.	14.6	135.7	125.	163.	-10.	15.2	131.6	140.	346.	20.
100312Z	13.7	142.9	85	13.7	142.8	85.	6.	0.	14.8	139.2	115.	55.	-10.	15.8	135.3	130.	120.	0.	16.8	131.5	130.	310.	0.
100318Z	14.2	142.2	90	14.1	142.2	90.	6.	0.	15.0	138.6	120.	24.	-10.	17.3	134.8	130.	93.	5.	19.1	131.2	130.	263.	5.
100400Z	14.5	141.4	100	14.5	141.2	90.	12.	-10.	16.0	137.9	100.	24.	-40.	17.3	134.5	110.	116.	-5.	19.3	131.3	120.	281.	0.
100406Z	15.0	140.6	110	14.9	140.7	95.	8.	-15.	16.5	137.8	105.	13.	-30.	17.9	134.8	115.	109.	-5.	19.3	131.3	125.	352.	10.
100412Z	15.3	140.0	125	15.5	140.0	125.	12.	0.	17.8	138.8	130.	120.	0.	19.9	138.2	115.	161.	-15.	22.0	138.0	100.	189.	-15.
100418Z	15.7	139.0	130	16.2	139.0	130.	30.	0.	19.4	137.6	135.	116.	10.	22.2	137.2	115.	122.	-10.	24.7	137.2	95.	88.	-15.
100500Z	16.1	138.3	140	16.2	138.2	140.	8.	0.	17.9	135.6	120.	48.	5.	20.2	133.8	110.	140.	-10.	22.4	132.9	100.	491.	-10.
100506Z	16.6	137.6	135	16.6	137.7	140.	6.	5.	18.3	135.1	115.	81.	-5.	20.7	133.5	105.	208.	-10.	23.1	132.8	100.	502.	-5.
100512Z	17.2	136.8	130	17.2	136.9	135.	6.	5.	19.1	134.4	115.	96.	-15.	21.7	133.1	105.	228.	-10.	24.1	132.6	95.	597.	-5.
100518Z	17.9	136.3	125	17.8	135.9	125.	24.	0.	20.2	133.8	105.	103.	-20.	22.5	132.9	95.	300.	-15.	24.8	132.4	90.	[illegible]35.	-5.
100600Z	18.6	136.0	115	18.7	135.8	115.	13.	0.	21.8	134.2	100.	68.	-20.	26.5	134.1	85.	190.	-25.	34.0	139.2	65.	260.	-20.
100606Z	19.6	135.5	120	19.4	135.4	115.	13.	-5.	22.2	134.2	100.	114.	-15.	25.3	133.9	85.	361.	-29.	32.8	138.4	65.	422.	-15.
100612Z	20.4	135.4	130	20.6	135.3	120.	13.	-10.	25.8	135.2	105.	87.	-10.	31.8	139.2	90.	43.	-10.	0.0	0.0	0.	-0.	0.
100618Z	21.2	135.3	125	21.2	135.1	120.	11.	-5.	25.9	135.2	100.	82.	-10.	32.0	139.5	90.	169.	-5.	0.0	0.0	0.	-0.	0.
100700Z	22.0	135.4	120	21.9	135.2	120.	13.	0.	26.2	136.0	100.	117.	-10.	32.8	142.3	90.	146.	5.	0.0	0.0	0.	-0.	0.
100706Z	23.5	135.7	115	23.3	135.8	115.	13.	0.	30.9	140.4	95.	123.	-10.	36.2	157.2	60.	532.	-20.	0.0	0.0	0.	-0.	0.
100712Z	24.5	135.9	115	24.6	136.0	115.	8.	0.	31.8	141.6	90.	83.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100718Z	26.1	136.7	110	26.0	136.8	110.	8.	0.	33.7	145.2	80.	141.	-15.	0.0	0.9	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100800Z	27.7	137.4	110	27.7	137.3	110.	5.	0.	35.2	149.2	80.	240.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100806Z	29.8	138.4	105	29.6	138.8	105.	24.	0.	36.0	153.0	70.	367.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100812Z	31.6	140.0	100	31.8	139.7	100.	19.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100818Z	33.4	142.4	95	33.8	142.3	90.	25.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100900Z	34.5	144.4	85	34.7	144.0	85.	23.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100906Z	35.4	146.3	80	35.[illegible]	146.3	80.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	14.	90.	162.	294.	13.	90.	162.	294.
AVG RIGHT ANGLE ERROR	13.	63.	104.	149.	12.	63.	104.	149.
AVG INTENSITY MAGNITUDE ERROR	2.	14.	21.	24.	3.	14.	21.	24.
AVG INTENSITY BIAS	-2.	-13.	-20.	-20.	-2.	-13.	-20.	-20.
NUMBER OF FORECASTS	32	28	24	20	29	28	24	20

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2287. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 12. KNOTS

SUPER TYPHOON MAC
FIX POSITIONS FOR CYCLONE NO. 23

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	010000	12.5N 152.0E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	010300	12.4N 151.5E	PCN 6			PGTW
3	010510	12.6N 151.0E	PCN 5			PGTW
4	010600	12.5N 150.0E	PCN 6			PGTW
5	010900	12.7N 151.0E	PCN 6		ULAC FIX	PGTW
6	011200	12.7N 150.1E	PCN 6			PGTW
7	011600	12.2N 149.1E	PCN 6			PGTW
8	011800	12.0N 148.7E	PCN 6			PGTW
9	012100	12.0N 148.4E	PCN 6			PGTW
10	020000	11.8N 148.6E	PCN 6	T2.0/2.0 /D1.0/24HRS		PGTW
11	020300	12.2N 148.0E	PCN 6		BASED ON EXTRAP	PGTW
12	020450	12.8N 147.6E	PCN 5			PGTW
13	020600	12.6N 147.4E	PCN 6			PGTW
14	020900	12.9N 146.8E	PCN 6		BASED ON EXTRAP	PGTW
15	021200	12.9N 146.2E	PCN 6			PGTW
16	021600	12.6N 145.3E	PCN 6			PGTW
17	021743	12.6N 145.6E	PCN 5			PGTW
18	021800	12.6N 145.5E	PCN 6			PGTW
19	022100	12.9N 144.9E	PCN 6			PGTW
20	030000	13.1N 144.7E	PCN 6	T4.0/4.0+/D2.0/24HRS		PGTW
21	030300	13.3N 144.2E	PCN 4			PGTW
22	030446	13.4N 143.9E	PCN 4			PGTW
23	030600	13.4N 143.8E	PCN 2			PGTW
24	030900	13.6N 143.4E	PCN 2			PGTW

25	031200	13.6N 143.0E	PCN 4			PGTW
26	031600	14.1N 142.3E	PCN 4			PGTW
27	031731	14.3N 142.0E	PCN 3			PGTW
28	031800	14.3N 142.0E	PCN 4			PGTW
29	032100	14.3N 141.7E	PCN 4			PGTW
30	040000	14.5N 141.5E	PCN 2	T5.0/5.0 /D1.0/24HRS		PGTW
31	040300	14.8N 141.1E	PCN 2		EYE DIA 20NM	PGTW
32	040434	15.0N 140.7E	PCN 1		EYE DIA 20NM	PGTW
33	040600	15.1N 140.6E	PCN 2			PGTW
34	040900	15.2N 140.3E	PCN 2		EYE DIA 20NM	PGTW
35	041200	15.5N 140.0E	PCN 2			PGTW
36	041600	15.7N 139.2E	PCN 2			PGTW
37	041719	16.1N 139.1E	PCN 1			PGTW
38	041800	15.8N 139.1E	PCN 2			PGTW
39	042100	16.0N 138.7E	PCN 2			PGTW
40	050000	16.3N 138.4E	PCN 2	T6.0/6.0 /D1.0/24HRS		PGTW
41	050300	16.5N 138.0E	PCN 2			PGTW
42	050604	16.7N 137.8E	PCN 1			PGTW
43	050900	17.1N 137.2E	PCN 2		EYE DIA 15NM	PGTW
44	051200	17.4N 137.0E	PCN 2			PGTW
45	051600	17.6N 136.1E	PCN 4			PGTW
46	051800	17.8N 136.0E	PCN 4			PGTW
47	052100	18.3N 136.0E	PCN 4			PGTW
48	060000	18.5N 136.1E	PCN 2	T5.0/6.0 /W1.0/24HRS		PGTW
49	060400	19.2N 135.7E	PCN 2			PGTW
50	060552	19.6N 135.7E	PCN 2			PGTW
51	060900	20.0N 135.6E	PCN 2			PGTW
52	061200	20.4N 135.4E	PCN 2			PGTW
53	061600	20.8N 135.2E	PCN 2			PGTW
54	061800	21.1N 135.1E	PCN 2			PGTW
55	062100	21.4N 135.3E	PCN 2			PGTW
56	070000	21.8N 135.5E	PCN 2	T6.0/6.0-/D1.0/24HRS		PGTW
57	070400	22.8N 135.7E	PCN 2			PGTW
58	070540	23.4N 135.0E	PCN 1			PGTW
59	070900	23.9N 135.9E	PCN 2			PGTW
60	071200	24.5N 136.1E	PCN 2			PGTW
61	071600	25.5N 136.5E	PCN 2			PGTW
62	071800	26.0N 136.6E	PCN 2			PGTW
63	072100	26.9N 137.0E	PCN 2			PGTW
64	080000	27.6N 137.5E	PCN 2	T5.0/5.0 /W1.0/24HRS		PGTW
65	080400	28.9N 138.2E	PCN 2			PGTW
66	080527	29.7N 138.5E	PCN 1			PGTW
67	080900	30.7N 139.4E	PCN 6			PGTW
68	081200	31.4N 140.0E	PCN 4			PGTW
69	081600	33.2N 142.1E	PCN 6		ULCC FIX	PGTW
* 70	081812	34.0N 143.7E	PCN 5		ULCC FIX	PGTW
71	082100	33.9N 143.4E	PCN 4			PGTW
72	090000	34.1N 144.1E	PCN 4	T3.5/4.5 /W1.5/24HRS	ULCC FIX	PGTW
73	090400	35.1N 145.6E	PCN 4			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	ORIEN-TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	012204	11.9N 140.8E	1500FT		1000	30 050 20	120 36 030 24	7 2				+24 +23 +23 30	1
2	020130	12.2N 140.3E	1500FT		1000	25 290 20	290 37 220 14	7 5				+24 +24 +23 30	1
3	020601	12.4N 147.5E	1500FT		993	45 140 20	220 44 140 20	10 10					2
4	020902	12.5N 146.9E	700MB	3050	1002		170 39 070 15	5 5				+ 8 +13 +11	2
5	021505	12.7N 145.8E	700MB	2980			160 44 090 10	5 [illegible]				+10 +14	3
6	021800	12.6N 145.4E	700MB	2929			100 57 090 5	5 1	ELLIPTICAL	17 12	090		3
7	022005	12.8N 145.2E	700MB	2920	981	30 290 90	020 51 020 10	5 2	ELLIPTICAL	22 12	150	+11 +16 +13	3
8	030133	13.2N 144.4E	700MB	2810	966	87 030 5	140 79 040 7	5 2	ELLIPTICAL	15 10	120	+12 +15 +14	4
9	030600	13.3N 143.7E	700MB	2751		80 040 10	160 77 040 8	4 3				+17 +10	5
10	030820	13.5N 143.4E	700MB	2700	955	60 150 30	080 98 350 11	5 2	ELLIPTICAL	18 8	090	+14 +18 +13	5
11	031211	13.8N 142.8E	700MB	2692			100 82 070 12	8 1					7
12	031436	13.9N 142.6E	700MB	2680	954		200 75 130 19	5 1	CIRCULAR	8		+14 +15 +12	7
13	032015	14.2N 141.0E	700MB	2690	954	90 360 10	350 45 260 35	15 2	CIRCULAR	30		+10 +15 +13	8
14	040050	15.6N 139.9E	700MB	2331	909	100 330 6	180 104 080 18	25 1	CIRCULAR	15		+11 +29 + 1	9
15	041156	15.2N 140.0E	700MB	2291			170 112 080 18	15 1					9
16	042107	15.9N 138.6E	700MB	2173	895	100 360 7	110 102 030 8	5 1	CIRCULAR	12		+11 +24 +10	10
17	051009	17.1N 137.1E	700MB	2273	900		130 97 020 15	5 2	CONCENTRIC	07 40		+10 +21	11
18	051249	17.4N 136.7E	700MB	2350			210 95 130 25	8 2					11
19	051924	18.0N 136.3E	700MB	2372			230 87 110 20	10 5					12
20	052219	18.3N 136.0E	700MB	2303	920	80 020 10	130 110 050 35	10 10	CONCENTRIC	12 25		+11 +17 +16	13
21	060704	19.8N 135.6E	700MB	2396		60 050 10	190 145 050 25	10 3					15
22	060931	20.1N 135.5E	700MB	2332	914		270 100 100 25	15 5	CIRCULAR	25		+12 +20 +12	15
23	061913	21.2N 135.3E	700MB	2314			100 96 030 10	5 5					16
24	062145	21.6N 135.3E	700MB	2346	918	50 040 90	300 100 200 30	5 5	CIRCULAR	25		+13 +17 +15	16
25	070937	24.0N 135.8E	700MB	2421	924		190 110 110 25	10 2	CIRCULAR	30		+13 +17 +15	18
26	071214	24.6N 135.9E	700MB	2441			100 83 070 30	10 2					18
27	071835	26.2N 136.7E	700MB	2467			280 93 180 19	7 3					19
28	072112	26.8N 136.8E	700MB	2500	932	90 100 60	190 100 100 30	7 4	ELLIPTICAL	30 20	140	+14 +17 +16	19
29	080627	29.8N 138.4E	700MB	2545		100 250 5	200 90 090 30	5 1					20
30	080853	30.7N 139.1E	700MB	2566	945		140 87 020 20	5 5				+13 +22 + 8	20
31	082035	33.8N 143.0E	700MB	2733	959	80 090 120	210 100 130 100	3 5				+19 +20 +12	21
32	082332	34.4N 144.2E	700MB	2763			030 82 280 110	10 4					21

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	020635	12.7N 147.3E	LAND	FAIR					13.6N 144.9E	91218
2	020735	12.7N 147.3E	LAND	GOOD					13.6N 144.9E	91218
3	020835	12.7N 147.2E	LAND	GOOD					13.6N 144.9E	91218
4	020935	12.8N 147.1E	LAND	POOR					13.6N 144.9E	91218
5	021035	12.7N 146.7E	LAND	FAIR					13.6N 144.9E	91218
6	021135	12.7N 146.6E	LAND	GOOD					13.6N 144.9E	91218
7	021235	12.8N 146.3E	LAND	GOOD					13.6N 144.9E	91218
8	021335	12.8N 146.2E	LAND	GOOD					13.6N 144.9E	91218
9	021435	12.8N 146.1E	LAND	GOOD					13.6N 144.9E	91218
10	021540	12.8N 145.8E	LAND	GOOD					13.6N 144.9E	91218
11	021640	12.8N 145.7E	LAND	FAIR					13.6N 144.9E	91218
12	021735	12.8N 145.7E	LAND	FAIR	CIRCULAR	25			13.6N 144.9E	91218
13	021835	12.8N 145.4E	LAND	GOOD	CIRCULAR	25			13.6N 144.9E	91218
14	021935	12.8N 145.3E	LAND	FAIR					13.6N 144.9E	91218
15	022040	12.9N 145.1E	LAND	GOOD	CIRCULAR	18			13.6N 144.9E	91218
16	022140	12.8N 144.8E	LAND	GOOD	CIRCULAR	16			13.6N 144.9E	91218
17	022235	12.8N 144.6E	LAND	GOOD	ELLIPTICAL			FLIP AXIS 10/4	13.6N 144.9E	91218
18	030035	13.1N 144.5E	LAND	GOOD	CIRCULAR	11			13.6N 144.9E	91218
19	030135	13.1N 144.3E	LAND	GOOD	CIRCULAR	10			13.6N 144.9E	91218
20	030235	13.2N 144.2E	LAND	GOOD	CIRCULAR	9			13.6N 144.9E	91218
21	030335	13.2N 144.0E	LAND	GOOD	CIRCULAR	10			13.6N 144.9E	91218
22	030435	13.2N 143.9E	LAND	FAIR		14			13.6N 144.9E	91218
23	030535	13.3N 143.8E	LAND	FAIR		16			13.6N 144.9E	91218
24	030630	13.4N 143.8E	LAND	FAIR		11			13.6N 144.9E	91218
25	030830	13.5N 143.4E	LAND	POOR		13		OPEN N-SE	13.6N 144.9E	91218
26	031030	13.6N 143.2E	LAND	FAIR		7			13.6N 144.9E	91218
27	031130	13.6N 143.0E	LAND	FAIR		5			13.6N 144.9E	91218
28	031235	13.7N 142.8E	LAND	FAIR		6			13.6N 144.9E	91218
29	031335	13.8N 142.8E	LAND	FAIR		8		OPEN NE	13.6N 144.9E	91218
30	031435	13.8N 142.7E	LAND	GOOD		7		OPEN N	13.6N 144.9E	91218
31	031535	13.9N 142.2E	LAND	FAIR					13.6N 144.9E	91218
32	031635	14.1N 142.2E	LAND	POOR					13.6N 144.9E	91218
33	080900	30.4N 138.9E	LAND				65/// /////		35.3N 138.7E	47639
34	081300	31.6N 141.2E	LAND				65/// 50749		35.3N 138.7E	47639
35	082000	34.2N 143.0E	LAND				35/// 50422		35.3N 138.7E	47639

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON NANCY
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101006Z	16.1	146.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101012Z	16.0	144.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101018Z	15.8	142.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101100Z	15.9	141.3	30	16.1	141.2	25.	13.	-5.	18.7	136.2	35.	170.	-5.	22.2	133.3	45.	382.	-20.	27.8	133.9	55.	780.	-45.
101106Z	16.2	139.9	35	16.2	139.9	35.	0.	0.	17.8	135.2	45.	120.	0.	21.6	132.2	55.	337.	-15.	26.8	133.0	55.	763.	-60.
101112Z	16.2	138.5	40	16.3	138.5	40.	6.	0.	18.2	133.8	55.	147.	0.	21.3	131.5	55.	321.	-20.	26.8	133.0	55.	827.	-50.
101118Z	16.0	137.0	45	16.4	136.4	45.	42.	0.	18.3	132.2	55.	129.	-5.	21.2	130.3	55.	310.	-25.	26.8	133.0	55.	877.	-25.
101200Z	15.9	135.7	40	16.0	135.7	40.	6.	0.	16.2	130.8	50.	21.	-15.	17.8	126.1	60.	63.	-40.	19.4	120.4	50.	121.	-5.
101206Z	15.9	134.2	45	15.6	134.2	45.	18.	0.	15.7	129.3	55.	60.	-15.	17.3	124.8	65.	77.	-50.	19.2	120.0	55.	142.	-5.
101212Z	15.9	132.9	55	15.9	132.9	55.	0.	0.	16.3	127.1	75.	71.	0.	18.3	122.2	70.	60.	-35.	20.1	117.2	60.	174.	-5.
101218Z	16.2	131.7	60	16.0	131.4	60.	21.	0.	16.9	125.7	75.	60.	-5.	18.8	120.8	60.	84.	-20.	20.2	115.7	50.	188.	-20.
101300Z	16.4	130.5	65	16.5	130.4	65.	8.	0.	18.6	126.4	90.	96.	-10.	20.9	124.2	100.	326.	45.	23.1	123.1	110.	602.	35.
101306Z	16.7	129.3	70	17.0	129.4	70.	19.	0.	19.2	125.8	90.	162.	-25.	21.3	123.8	100.	384.	40.	24.3	123.0	110.	702.	35.
101312Z	17.1	128.0	75	17.1	128.2	75.	11.	0.	18.8	124.2	95.	145.	-10.	21.2	120.8	85.	311.	20.	24.4	118.8	60.	585.	-20.
101318Z	17.4	126.6	80	17.3	126.7	80.	8.	0.	19.2	121.9	85.	122.	5.	22.3	119.2	75.	355.	5.	26.2	117.7	45.	656.	-35.
101400Z	17.7	125.0	100	17.9	125.0	100.	12.	0.	20.0	120.4	80.	155.	25.	23.0	117.3	70.	394.	-5.	25.9	115.9	35.	605.	-40.
101406Z	17.6	123.5	115	18.2	123.3	115.	38.	0.	20.5	119.7	80.	204.	20.	23.8	116.9	70.	461.	-5.	0.0	0.0	0.	-0.	0.
101412Z	17.3	122.2	105	17.3	122.2	105.	0.	0.	16.3	117.8	65.	61.	0.	16.3	112.8	70.	62.	-10.	17.0	107.9	80.	78.	5.
101418Z	17.4	120.9	80	17.5	120.8	80.	8.	0.	17.2	116.1	75.	8.	5.	18.0	111.2	85.	49.	5.	20.0	106.6	55.	74.	-20.
101500Z	17.5	119.7	55	17.5	119.7	70.	0.	15.	17.7	114.8	85.	48.	10.	18.6	110.6	70.	77.	-5.	20.2	106.6	50.	80.	-25.
101506Z	17.3	118.5	60	17.7	118.3	70.	27.	10.	17.6	113.4	90.	42.	15.	18.1	109.3	65.	39.	-10.	19.9	105.5	45.	57.	-25.
101512Z	17.2	117.3	65	17.3	117.2	65.	8.	0.	18.3	112.2	80.	79.	0.	20.5	108.2	55.	134.	-20.	0.0	0.0	0.	-0.	0.
101518Z	17.1	116.2	70	17.5	115.8	70.	33.	0.	18.8	110.8	80.	97.	0.	20.3	106.2	40.	98.	-35.	0.0	0.0	0.	-0.	0.
101600Z	16.9	114.7	75	17.0	114.8	70.	8.	-5.	16.8	109.9	65.	42.	-10.	16.4	105.8	30.	156.	-45.	0.0	0.0	0.	-0.	0.
101606Z	16.9	113.3	75	16.8	113.2	75.	8.	0.	16.3	108.0	55.	99.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101612Z	17.0	112.0	80	17.0	112.0	80.	0.	0.	17.7	107.4	60.	43.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101618Z	17.2	111.0	80	17.2	111.0	75.	0.	-5.	18.8	106.8	45.	6.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101700Z	17.5	109.9	75	17.7	109.7	75.	17.	0.	19.2	105.7	45.	21.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101706Z	17.8	108.7	75	17.7	108.9	75.	13.	0.	18.8	104.9	30.	21.	-40.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101712Z	18.3	107.8	75	18.2	107.7	80.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101718Z	18.8	106.9	75	18.9	106.8	70.	8.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101800Z	19.0	106.0	75	19.1	106.0	70.	6.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101806Z	19.0	105.2	70	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	12.	86.	213.	430.	12.	86.	213.	430.
AVG RIGHT ANGLE ERROR	10.	74.	175.	333.	10.	74.	175.	333.
AVG INTENSITY MAGNITUDE ERROR	2.	12.	23.	27.	2.	12.	23.	27.
AVG INTENSITY BIAS	0.	-6.	-12.	-10.	0.	-6.	-12.	-10.
NUMBER OF FORECASTS	29	26	21	17	28	26	21	17

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 2400. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 13. KNOTS

TYPHOON NANCY
FIX POSITIONS FOR CYCLONE NO. 24

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	100503	16.1N	147.0E	PCN 3	T1.5/1.5	INIT OBS	PGTW
2	100900	16.3N	145.0E	PCN 6			PGTW
3	101200	16.1N	144.5E	PCN 6		ULAC FIX	PGTW
4	101600	15.8N	143.5E	PCN 6		ULAC FIX	PGTW
5	101800	15.7N	142.6E	PCN 6		ULAC FIX	PGTW
6	102100	15.9N	141.6E	PCN 6		ULAC FIX	PGTW
7	110000	15.9N	141.4E	PCN 4			PGTW
8	110400	16.0N	139.8E	PCN 6	T2.5/2.5 /D1.0/23HRS		PGTW
9	110451	16.0N	139.6E	PCN 3			PGTW
10	110600	15.9N	140.1E	PCN 4			PGTW
11	110900	16.2N	139.2E	PCN 6			PGTW
12	111200	15.8N	138.8E	PCN 6		ULAC FIX	PGTW
13	111600	16.1N	137.3E	PCN 6		ULAC FIX	PGTW
14	111736	16.3N	136.6E	PCN 6		ULAC FIX	PGTW
15	112100	16.3N	136.1E	PCN 6		ULAC FIX	PGTW
16	120000	15.8N	135.5E	PCN 4			PGTW
17	120400	15.8N	134.7E	PCN 4	T3.0/3.0 /D0.5/24HRS		PGTW
18	120621	15.9N	134.2E	PCN 3			PGTW
19	120900	16.0N	133.9E	PCN 4			PGTW
20	121200	16.0N	132.8E	PCN 4			PGTW
21	121600	16.2N	131.8E	PCN 4			PGTW
22	121800	16.3N	131.5E	PCN 4			PGTW
23	122100	16.4N	131.1E	PCN 4			PGTW

24	130000	16.4N	130.6E	PCN 4		ULCC FIX	PGTW
25	130300	16.6N	130.0E	PCN 2	T4.5/4.5-/D1.5/23HRS		PGTW
26	130609	16.8N	129.2E	PCN 1			PGTW
27	130609	16.9N	129.3E	PCN 1	T4.5/4.5	INIT OBS EYE DIA 6NM	RPMK
28	130900	17.1N	128.8E	PCN 2			PGTW
29	131200	17.2N	128.1E	PCN 4			PGTW
30	131600	17.4N	126.9E	PCN 2			PGTW
31	131854	17.6N	126.5E	PCN 1			PGTW
32	132100	17.6N	125.7E	PCN 2			PGTW
33	140000	17.7N	124.9E	PCN 2			PGTW
34	140300	17.8N	124.2E	PCN 2	T5.5/5.5-/D1.0/24HRS		PGTW
35	140556	17.7N	123.1E	PCN 1			PGTW
36	140556	17.7N	123.4E	PCN 1	T6.0/6.0-/D1.5/24HRS		RPMK
37	140900	17.7N	123.0E	PCN 2			PGTW
38	141200	17.7N	122.3E	PCN 2			PGTW
39	141600	17.7N	121.2E	PCN 6			PGTW
40	141800	17.7N	120.9E	PCN 6			PGTW
41	141841	17.8N	120.5E	PCN 5			PGTW
42	142100	17.6N	120.0E	PCN 6		ULCC FIX	PGTW
43	150000	17.5N	119.6E	PCN 6	T4.5/5.0+/W1.0/21HRS	ULAC FIX	PGTW
44	150300	17.4N	119.1E	PCN 2			PGTW
45	150600	17.5N	118.5E	PCN 2			PGTW
46	150726	17.4N	118.1E	PCN 5	T4.0/4.5+/W2.0/25HRS		RPMK
47	150900	17.4N	117.8E	PCN 2			PGTW
48	151200	17.7N	117.1E	PCN 4			PGTW
49	151600	17.7N	116.1E	PCN 6			PGTW
50	151800	17.6N	115.6E	PCN 6			PGTW
51	151829	17.2N	116.0E	PCN 5			RPMK
52	152100	17.1N	115.2E	PCN 6			PGTW
53	160000	17.0N	114.4E	PCN 4			PGTW
54	160300	16.9N	113.8E	PCN 2	T5.0/5.0 /D0.5/27HRS		PGTW
55	160600	16.9N	113.4E	PCN 2			PGTW
56	160714	17.0N	113.8E	PCN 1	T4.5/4.5-/D0.5/24HRS		RPMK
57	160900	17.0N	112.7E	PCN 2		EYE DIA 25NM	PGTW
58	161200	17.0N	112.1E	PCN 2			PGTW
59	161600	17.2N	111.3E	PCN 2			PGTW
60	161800	17.3N	110.9E	PCN 2			PGTW
61	161959	17.4N	110.7E	PCN 1		EYE DIA 36NM	RPMK
62	162100	17.5N	110.4E	PCN 2			PGTW
63	170000	17.6N	109.9E	PCN 2			PGTW
64	170300	17.6N	109.4E	PCN 2	T5.5/5.5-/D0.5/24HRS		PGTW
65	170600	17.9N	108.8E	PCN 2			PGTW
66	170702	18.0N	108.3E	PCN 1	T5.0/5.0-/D0.5/24HRS	EYE DIA 40NM	RPMK
67	170900	18.1N	108.1E	PCN 2			PGTW
68	171200	18.4N	107.8E	PCN 2			PGTW
69	171600	18.7N	107.2E	PCN 2			PGTW
70	171800	18.9N	106.9E	PCN 2			PGTW
71	171947	19.0N	106.7E	PCN 1			RPMK
72	172100	19.0N	106.5E	PCN 2			PGTW
73	180000	18.8N	106.0E	PCN 2			PGTW
74	180300	18.9N	105.7E	PCN 4	T4.0/5.0-/W1.5/24HRS		PGTW
75	180600	18.9N	105.2E	PCN 4			PGTW
76	180900	19.0N	105.0E	PCN 6		ULCC FIX	PGTW
77	181200	18.8N	104.7E	PCN 6		ULAC FIX	PGTW
78	181600	18.8N	105.0E	PCN 6			PGTW
79	181800	18.8N	104.9E	PCN 6			PGTW
80	200000	18.8N	104.3E	PCN 6			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	110135	15.9N 141.2E	1500FT		10A6	25 360 10	220 20 130 30	2 5			+23 +23 +22 30	1
2	110543	16.2N 140.1E	1500FT		999	40 360 10	110 52 030 90	5 1				2
3	110750	16.2N 139.4E	1500FT		998	25 250 40	340 21 250 90	5 2			+31 +31 +24 27	2
4	112114	15.9N 136.2E	1500FT	3032	999	40 010 20	160 50 010 20	10 10			+24 +22	3
5	112350	15.0N 135.7E	1500FT		998	35 270 30	040 55 300 40	10 4				3
6	120613	15.9N 134.2E	700MB	2982	988	50 300 10	050 38 300 90	8 3				4
7	120823	15.9N 133.0E	700MB	2930	985	55 270 7	160 63 030 10	8 2			+ 9 +13 + 9	4
8	122005	16.2N 131.2E	700MB	2868	975		060 73 360 21	10 2	CIRCULAR	10	+12 +17	5
9	122217	16.3N 130.9E	700MB	2867		50 090 10	130 76 060 27	5 2				5
10	130615	16.6N 129.5E	700MB	2830		80 040 12	190 70 140 40	15 2				6
11	130858	16.8N 128.0E	700MB	2790	970	75 350 20	020 73 350 50	15 2	CIRCULAR	20	+10 +14 +13	6
12	132158	17.7N 125.4E	700MB	2616	946	100 140 5	100 117 040 10	15 3	CIRCULAR	12	+14 +17 +10	7
13	140015	17.8N 125.0E	700MB	2627		100 260 15	010 60 270 40	15 2				7
14	140701	17.6N 123.4E	700MB	2547		100 090 5	150 117 070 15	10 1				8
15	140941	17.5N 122.8E	700MB	2497	933	100 360 13	090 117 360 18	5 2	CIRCULAR	20	+12 +21 + 9	8
16	150725	17.2N 118.3E	700MB	2955		65 040 30	150 45 040 30	5 5				9
17	151005	17.0N 117.8E	700MB	2936	985	60 340 65	040 63 350 40	5 5	CIRCULAR	35	+11 +15 + 8	9
18	152123	17.1N 115.4E	700MB	2852	973	55 360 60	110 82 360 20	15 3	CIRCULAR	50	+12 +12 +12	10
19	160023	16.8N 114.7E	700MB	2849		70 080 15	060 79 360 75	10 5				10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	140400	18.0N 124.0E	LAND				///// 22902		18.3N 121.6E	98231
2	140600	17.8N 123.6E	LAND				///// 42610	EYE 70 PCT ELPTCL 65/50 KMS	18.3N 121.6E	98231
* 3	140630	18.4N 123.6E	LAND				4//// /////		18.3N 121.6E	98231
4	141300	17.7N 122.0E	LAND				11052 42513		18.3N 121.6E	98231
5	141330	17.6N 121.9E	LAND				11194 42510		18.3N 121.6E	98231
6	141400	17.6N 121.8E	LAND				12334 42710		18.3N 121.6E	98231
7	141500	17.6N 121.6E	LAND				10184 42510		18.3N 121.6E	98231
8	142300	17.6N 119.9E	LAND				1063/ /////		16.3N 120.6E	98321
9	150000	17.6N 119.7E	LAND				129// 42711	EYE 100 PCT ELLIPTICAL	16.3N 120.6E	98321
10	150300	17.8N 118.8E	LAND				129// 42708	EYE 90 PCT ELLIPTICAL	16.3N 120.6E	98321
11	150330	17.8N 118.7E	LAND				129// 42605		16.3N 120.6E	98321
12	150400	17.7N 118.7E	LAND				129// 42705		16.3N 120.6E	98321
13	151200	17.3N 117.0E	LAND				1091/ 42710		16.3N 120.6E	98321
14	151430	17.3N 116.5E	LAND				1091/ 42710		16.3N 120.6E	98321

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	141500	17.3N 121.8E	090	020	WMO 98233
2	160900	17.0N 112.7E	080	030	WMO 59981

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 25
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101506Z	18.3	137.0	20	18.0	137.0	25.	10.	5.	19.0	134.0	30.	133.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101512Z	18.9	136.9	20	18.8	136.8	25.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101518Z	19.0	136.1	20	18.9	135.2	20.	74.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101600Z	20.5	135.4	15	19.5	135.2	20.	61.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101606Z	21.0	135.0	15	21.2	134.9	15.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	35.	133.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	33.	119.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	15.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	15.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	1	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 220. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

TROPICAL DEPRESSION TD25
FIX POSITIONS FOR CYCLONE NO. 25

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	140000	17.1N 143.7E	PCN 6	T1.5/1.5	INIT OBS	PGTW
2	140300	17.5N 142.8E	PCN 6			PGTW
3	140600	17.9N 142.0E	PCN 6		ULAC FIX	PGTW
4	140900	18.1N 141.3E	PCN 6		ULAC FIX	PGTW
5	141200	17.6N 140.4E	PCN 6		ULCC FIX	PGTW
6	141600	18.2N 139.4E	PCN 6			PGTW
7	141800	17.7N 139.0E	PCN 6		ULAC FIX	PGTW
8	142100	18.1N 138.1E	PCN 6		ULAC FIX	PGTW
9	150000	17.8N 138.0E	PCN 6	T2.0/2.0 /D0.5/24HRS		PGTW
10	150300	17.9N 138.2E	PCN 6			PGTW
11	150544	18.7N 137.9E	PCN 6			PGTW
12	150600	18.7N 137.9E	PCN 4			PGTW
13	150900	18.9N 137.4E	PCN 6			PGTW
14	160000	20.6N 135.3E	PCN 4	T1.0/1.5 /W1.0/24HRS		PGTW
15	160532	20.9N 135.6E	PCN 3			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	142336	17.8N 138.9E	1500FT		1006	20 030 60	210 26 140 50	5 2			+24 +25 +25 30	1

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON OWEN
BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101400Z	10.9	161.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101406Z	11.0	160.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101412Z	11.0	159.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101418Z	11.7	158.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101500Z	11.7	156.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101506Z	12.0	155.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101512Z	12.8	154.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101518Z	13.7	153.1	30	11.8	152.9	30.	115.	0.	12.8	147.4	45.	192.	5.	14.8	142.7	60.	258.	5.	15.6	137.9	70.	373.	0.
101600Z	14.6	152.1	35	13.8	151.6	35.	56.	0.	14.9	145.5	55.	159.	10.	17.0	141.2	75.	235.	15.	19.4	136.8	95.	386.	20.
101606Z	15.0	150.9	35	14.8	150.2	40.	42.	5.	15.6	144.2	60.	180.	15.	17.8	139.8	80.	283.	20.	20.2	135.2	100.	462.	20.
101612Z	15.0	149.6	40	15.2	149.5	45.	13.	5.	15.6	144.6	60.	120.	10.	17.2	139.7	75.	259.	10.	20.1	136.2	95.	402.	10.
101618Z	15.7	148.8	40	15.5	148.4	45.	26.	5.	16.3	144.0	65.	121.	10.	17.4	140.1	80.	217.	10.	20.2	137.1	100.	369.	10.
101700Z	16.2	147.9	45	16.5	147.8	45.	19.	0.	18.1	144.2	65.	87.	5.	20.0	140.9	85.	164.	10.	22.6	138.7	100.	290.	5.
101706Z	16.4	147.2	45	16.2	146.8	55.	26.	10.	17.5	143.1	70.	93.	10.	19.2	140.2	90.	186.	10.	21.8	137.8	105.	421.	5.
101712Z	16.7	146.5	50	16.8	146.5	55.	6.	5.	17.5	143.4	65.	46.	0.	18.8	140.6	90.	282.	5.	21.8	138.3	115.	508.	10.
101718Z	16.9	146.0	55	16.9	146.3	60.	17.	5.	18.4	144.5	75.	42.	5.	20.4	142.8	100.	182.	10.	22.9	140.9	120.	423.	15.
101800Z	17.1	145.3	60	17.2	145.7	60.	24.	0.	18.2	143.5	75.	48.	0.	20.0	141.7	95.	233.	0.	22.6	140.2	115.	599.	15.
101806Z	17.2	144.7	60	17.3	144.4	60.	10.	0.	18.1	140.9	80.	170.	0.	19.4	138.3	100.	477.	0.	21.8	136.3	110.	925.	20.
101812Z	17.6	144.2	65	17.3	144.1	60.	19.	-5.	17.8	141.0	80.	232.	-5.	19.8	137.8	100.	574.	-5.	21.6	136.2	110.	1027.	30.
101818Z	18.2	143.8	70	17.4	143.6	65.	49.	-5.	18.1	141.0	85.	270.	-5.	20.0	137.8	100.	673.	-5.	21.8	136.2	110.	1102.	40.
101900Z	19.0	143.6	75	18.8	143.7	75.	13.	0.	21.8	142.5	85.	119.	-10.	25.1	142.6	90.	403.	-10.	28.5	146.3	85.	408.	20.
101906Z	19.9	143.4	80	19.7	143.2	80.	16.	0.	22.7	142.4	90.	174.	-10.	26.1	143.2	85.	467.	-5.	29.0	147.6	80.	470.	20.
101912Z	21.0	143.3	85	21.0	143.2	85.	6.	0.	25.2	142.8	100.	172.	-5.	29.5	145.8	80.	350.	0.	31.3	149.8	65.	437.	5.
101918Z	22.0	143.4	90	22.2	143.4	85.	12.	-5.	26.3	144.4	95.	157.	-10.	31.2	148.4	75.	288.	5.	31.4	151.8	60.	402.	5.
102000Z	23.3	143.9	95	23.2	143.6	100.	10.	5.	28.8	145.8	100.	163.	0.	34.2	149.7	80.	353.	15.	39.6	154.5	65.	797.	10.
102006Z	24.6	144.8	100	24.5	144.6	95.	12.	-5.	30.5	147.1	80.	200.	-10.	39.1	152.1	60.	602.	0.	0.0	0.0	0.	-0.	0.
102012Z	25.8	145.9	105	26.0	146.0	95.	13.	-10.	31.1	150.4	75.	106.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102018Z	27.3	147.1	105	27.4	147.5	90.	22.	-15.	32.3	152.7	70.	102.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102100Z	28.8	148.9	100	28.8	148.8	105.	5.	5.	33.8	155.2	60.	106.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102106Z	29.9	150.9	90	29.8	151.2	90.	17.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102112Z	30.7	152.4	80	30.8	152.7	85.	17.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102118Z	31.0	154.0	70	31.2	154.0	70.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102200Z	30.7	155.3	65	31.0	155.5	50.	21.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102206Z	29.8	156.7	60	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102212Z	28.8	157.7	60	0.0	0.0	0	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102218Z	27.8	158.3	55	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102300Z	26.9	159.2	55	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102306Z	26.2	160.2	55	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102312Z	25.9	161.4	55	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102318Z	25.7	162.5	50	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102400Z	25.5	163.6	50	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102406Z	25.4	164.4	50	25.6	164.7	50.	20.	0.	25.8	169.2	60.	100.	10.	26.2	173.6	50.	410.	10.	0.0	0.0	0.	-0.	0.
102412Z	25.4	165.3	50	25.5	165.0	50.	20.	0.	26.7	170.2	50.	145.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102418Z	25.5	166.2	50	25.5	166.1	50.	5.	0.	26.2	169.1	50.	126.	5.	27.6	172.2	45.	377.	10.	0.0	0.0	0.	-0.	0.
102500Z	25.7	166.9	50	25.5	167.1	50.	16.	0.	26.1	170.3	45.	227.	0.	27.7	174.5	45.	515.	15.	0.0	0.0	0.	-0.	0.
102506Z	26.2	167.4	50	26.1	167.8	45.	22.	-5.	27.3	170.8	40.	255.	0.	28.3	174.2	35.	505.	5.	0.0	0.0	0.	-0.	0.
102512Z	26.8	167.5	50	26.6	168.5	45.	55.	-5.	28.5	171.6	40.	322.	5.	29.9	175.9	35.	544.	10.	0.0	0.0	0.	-0.	0.
102518Z	27.3	167.1	45	27.5	167.5	45.	24.	0.	29.8	167.0	45.	135.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102600Z	27.8	166.5	45	28.0	167.3	45.	44.	0.	30.2	167.0	40.	147.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102606Z	28.2	166.1	40	28.3	166.4	45.	17.	5.	30.6	165.2	35.	15.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102612Z	28.7	165.7	35	28.8	166.2	45.	27.	10.	31.0	165.2	0.	29.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102618Z	29.2	165.3	35	29.3	165.2	40.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102700Z	29.8	165.0	30	30.1	164.8	35.	21.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102706Z	30.6	164.9	30	30.2	164.2	35.	43.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102712Z	31.4	165.5	25	31.4	165.3	35.	10.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102718Z	32.3	166.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102800Z	33.3	167.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	24.	146.	362.	550.	21.	154.	339.	550.
AVG RIGHT ANGLE ERROR	18.	103.	236.	285.	16.	108.	212.	285.
AVG INTENSITY MAGNITUDE ERROR	4.	6.	8.	14.	4.	6.	8.	14.
AVG INTENSITY BIAS	1.	1.	6.	14.	0.	1.	5.	14.
NUMBER OF FORECASTS	40	32	24	18	36	29	21	18

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 3604. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TYPHOON OWEN
FIX POSITIONS FOR CYCLONE NO. 26

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	140000	9.4N 161.5E	PCN 6	T1.0/1.0	INIT OBS	PGTW
2	140414	10.3N 160.9E	PCN 6			PGTW
3	140600	10.6N 160.9E	PCN 6			PGTW
4	140900	10.8N 160.2E	PCN 6		ULAC FIX	PGTW
5	141200	11.5N 160.0E	PCN 6			PGTW
6	141600	12.2N 159.3E	PCN 6			PGTW
7	141659	11.8N 158.8E	PCN 5			PGTW
8	141800	11.6N 158.4E	PCN 6			PGTW
9	142100	11.7N 157.4E	PCN 6			PGTW
10	150000	11.8N 156.4E	PCN 6	T2.0/2.0 /D1.0/24HRS	ULAC FIX	PGTW
11	150402	11.8N 155.5E	PCN 5		ULAC FIX	PGTW
12	150600	12.2N 155.3E	PCN 6		ULAC FIX	PGTW
13	150900	12.6N 154.9E	PCN 6		ULAC FIX	PGTW
* 14	151200	12.3N 154.9E	PCN 6			PGTW
* 15	151600	11.6N 153.4E	PCN 6			PGTW
* 16	151800	11.5N 152.7E	PCN 6		BASED ON EXTRAP	PGTW
* 17	152100	13.3N 151.7E	PCN 6			PGTW
* 18	160000	14.7N 151.0E	PCN 6	T2.5/2.5 /D0.5/24HRS		PGTW
19	160300	14.6N 150.6E	PCN 6			PGTW
20	160600	14.6N 150.3E	PCN 6			PGTW
21	160900	14.6N 149.7E	PCN 6			PGTW
22	161200	14.6N 149.5E	PCN 6		ULCC FIX	PGTW
23	161635	15.2N 148.8E	PCN 6		ULCC FIX	PGTW
24	161800	15.2N 148.5E	PCN 6		ULCC FIX	PGTW
25	162100	16.0N 148.0E	PCN 6			PGTW
26	170000	16.5N 147.6E	PCN 6	T3.0/3.0 /D0.5/24HRS		PGTW
27	170300	16.1N 147.5E	PCN 4			PGTW
28	170520	16.4N 147.3E	PCN 3			PGTW
29	170900	16.3N 147.0E	PCN 6			PGTW
30	171200	16.4N 146.8E	PCN 6			PGTW
31	171600	16.9N 146.4E	PCN 6			PGTW
32	171800	17.5N 146.0E	PCN 6		BASED ON EXTRAP	PGTW
33	172100	17.5N 145.8E	PCN 6		BASED ON EXTRAP	PGTW
34	180000	17.4N 145.0E	PCN 6		BASED ON EXTRAP	PGTW
35	180300	17.1N 144.6E	PCN 4	T4.0/4.0 /D1.0/24HRS		PGTW
36	180600	17.2N 144.8E	PCN 6		ULCC FIX	PGTW
37	180900	17.0N 144.5E	PCN 6			PGTW
38	181200	17.1N 144.1E	PCN 6		ULAC FIX	PGTW
39	181600	17.6N 144.0E	PCN 6		ULAC FIX	PGTW
40	181800	18.3N 144.0E	PCN 6			PGTW
41	182100	18.4N 143.9E	PCN 6		ULAC FIX	PGTW
42	190000	18.7N 143.6E	PCN 6		ULCC FIX	PGTW
43	190300	19.2N 143.4E	PCN 4	T4.5/4.5 /D0.5/24HRS	EYE OPEN SW-NW	PGTW
44	190600	19.9N 143.4E	PCN 2			PGTW
45	190900	20.6N 143.2E	PCN 2		EYE OPEN SSE	PGTW
46	191200	21.1N 143.3E	PCN 4		ULAC FIX	PGTW
47	191600	21.8N 143.6E	PCN 4			PGTW
48	191741	22.0N 143.3E	PCN 2			PGTW
49	191800	22.2N 143.3E	PCN 2			PGTW
50	192100	22.5N 143.4E	PCN 2			PGTW
51	200000	23.3N 144.0E	PCN 2			PGTW
52	200300	24.0N 144.3E	PCN 2	T5.5/5.5-/D1.0/24HRS		PGTW
53	200443	24.2N 144.5E	PCN 1			PGTW
54	200600	24.7N 144.8E	PCN 2			PGTW
55	200900	25.3N 145.4E	PCN 2			PGTW
56	201200	26.2N 146.1E	PCN 2			PGTW
57	201600	27.0N 147.0E	PCN 2			PGTW
58	201720	27.4N 147.2E	PCN 1			PGTW
59	202100	28.2N 147.8E	PCN 2			PGTW
60	210000	28.6N 148.7E	PCN 2			PGTW
61	210300	29.1N 149.9E	PCN 2	T4.5/5.0 /W1.0/24HRS		PGTW
62	210431	29.5N 150.0E	PCN 4			PGTW
63	210600	29.9N 151.0E	PCN 4			PGTW
64	210900	30.1N 152.1E	PCN 4		ULCC FIX	PGTW
65	211200	30.6N 152.8E	PCN 6			PGTW
66	211600	30.9N 153.5E	PCN 6			PGTW
67	211716	30.7N 153.7E	PCN 5			PGTW
68	211800	30.9N 154.1E	PCN 6			PGTW
69	212100	30.8N 154.7E	PCN 6			PGTW
70	220000	30.7N 155.1E	PCN 6	T3.0/3.0 /W1.5/21HRS	ULAC FIX	PGTW
71	220300	30.7N 155.5E	PCN 6		ULAC FIX	PGTW
72	220419	30.2N 156.1E	PCN 6		ULAC FIX	PGTW
73	220600	29.6N 156.7E	PCN 6		ULAC FIX	PGTW
74	220900	29.2N 157.2E	PCN 6		ULAC FIX	PGTW
75	221200	28.7N 157.9E	PCN 6		ULCC FIX	PGTW
76	221600	27.7N 158.2E	PCN 6		ULCC FIX	PGTW
77	221800	27.5N 158.5E	PCN 6		ULCC FIX	PGTW
78	222100	27.2N 158.7E	PCN 6		ULCC FIX	PGTW
79	230000	26.9N 159.2E	PCN 4	T2.0/2.0 /W1.0/24HRS		PGTW
80	230300	26.7N 159.6E	PCN 4		EXP LLCC	PGTW
81	230407	26.2N 160.1E	PCN 4		EXP LLCC	PGTW
82	230600	26.2N 160.4E	PCN 6			PGTW
83	230900	25.7N 160.6E	PCN 6			PGTW
84	231200	25.7N 162.5E	PCN 6			PGTW

85	231600	25.0N 163.0E	PCN 6			PGTW
86	232100	25.3N 163.3E	PCN 6			PGTW
87	240000	25.7N 163.6E	PCN 6	T3.0/3.0-/D1.0/24HRS		PGTW
88	240355	25.6N 164.3E	PCN 5			PGTW
89	240600	25.7N 164.8E	PCN 4			PGTW
90	240900	25.7N 165.2E	PCN 6			PGTW
91	241200	25.6N 165.5E	PCN 6			PGTW
92	241600	25.7N 165.6E	PCN 6		ULCC FIX	PGTW
93	241639	25.4N 165.8E	PCN 6			KGWC
94	241640	25.6N 166.0E	PCN 6		ULCC FIX	PGTW
95	241800	25.6N 166.4E	PCN 6			PGTW
96	242100	25.6N 166.8E	PCN 6			PGTW
97	250000	25.8N 166.9E	PCN 6	T3.0/3.0-/S0.0/24HRS		PGTW
98	250300	26.1N 167.2E	PCN 6			PGTW
99	250342	26.2N 167.4E	PCN 6	T2.0/3.0-/W1.0/24HRS		KGWC
100	250343	26.1N 167.4E	PCN 5			PGTW
101	250600	26.3N 167.8E	PCN 6			PGTW
102	250900	26.4N 168.0F	PCN 6			PGTW
103	251200	26.5N 168.1E	PCN 6			PGTW
104	251600	26.9N 167.4E	PCN 4			PGTW
105	251627	27.1N 167.4E	PCN 4		ULCC FIX	PGTW
106	251627	27.0N 166.9E	PCN 6			KGWC
107	251800	27.5N 167.5E	PCN 6		ULCC FIX	PGTW
108	252100	27.7N 167.2E	PCN 6		ULCC FIX	PGTW
109	260000	27.9N 167.0E	PCN 6			PGTW
110	260300	27.7N 166.2E	PCN 6	T2.0/3.0-/W1.0/27HRS		PGTW
111	260330	27.7N 166.2E	PCN 6	T3.0/3.0 /D1.0/24HRS		KGWC
112	260600	28.3N 165.8E	PCN 6			PGTW
113	260900	28.5N 165.8E	PCN 6			PGTW
114	261200	29.1N 165.6E	PCN 6		ULAC FIX	PGTW
115	261600	29.2N 165.3E	PCN 6		ULAC FIX	PGTW
116	261800	29.4N 165.4E	PCN 6		ULAC FIX	PGTW
117	262100	29.7N 164.9E	PCN 6			PGTW
118	270000	29.5N 164.4E	PCN 4		EXP LLCC	PGTW
119	270300	29.9N 164.5E	PCN 4	T2.0/2.5-/S0.0/24HRS		PGTW
120	270318	30.1N 165.0E	PCN 4	T2.0/2.0 /W1.0/24HRS	EXP LLCC ULAC 31.6N 165.6E	KGWC
121	270600	30.5N 164.9E	PCN 4		EXP LLCC	PGTW
122	270900	31.0N 165.0E	PCN 6			PGTW
123	271200	31.4N 165.5E	PCN 6		ULAC 32.7N 165.6E	PGTW
124	271600	32.1N 166.5E	PCN 6			PGTW
125	271603	31.8N 166.0E	PCN 4		EXP LLCC ULAC 33.3N 167.2E	KGWC
126	271800	32.4N 167.0E	PCN 6			PGTW
127	272100	33.0N 167.4E	PCN 6			PGTW
128	280000	33.6N 168.7E	PCN 4	T1.0/1.5 /W1.0/21HRS		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	142312	11.2N 150.0E	1500FT		1005	15 360 60	020 21 200 50	5 20			+24 +18 +18 27	1
2	152317	14.3N 152.5E	1500FT			30 190 35	240 30 160 50	5 5			+25 +25 +23 30	2
3	160636	15.1N 150.0E	700MB	3036	995	45 120 15	040 35 270 60	5 4				3
4	160927	15.0N 150.1E	700MB	3041	999		170 45 070 70	5 4			+12 +11 +11	3
5	161422	15.6N 148.9E	700MB	3038	995		340 41 240 70	10 10			+10 +13 +11	4
6	161801	15.8N 148.8E	700MB	3023			140 37 050 90	8 10				4
7	162013	16.1N 148.4E	700MB	3022	992	30 260 60	360 43 260 120	8 8			+12 +13 +12	4
8	170228	16.2N 147.4E	1500FT		992	65 080 90	190 72 080 24	8 5			+25 +24 30	5
9	170606	16.6N 147.3E	700MB	2987		75 130 60	190 46 150 30	8 10				5
10	170833	16.4N 146.8E	700MB	2986	988		220 54 130 110	5 4			+10 +16 +11	6
11	171122	16.4N 146.9E	700MB	2985			140 55 040 90	5 4				6
12	172054	17.1N 145.8E	700MB	2933	983	60 090 30	190 52 080 120	2 5			+13 +14 +13	7
13	172325	17.1N 145.3E	700MB	2945		60 020 90	270 61 100 140	3 4				7
14	180845	17.2N 144.4E	700MB	2925	980		110 56 040 40	5 3			+13 +15 +14	9
15	181123	17.3N 144.3E	700MB	2914			200 60 110 60	10 8				9
16	182054	18.4N 143.8E	700MB	2823	969	75 020 30	140 73 020 30	5 2			+13 +16 + 9	10
17	182336	18.8N 143.6E	700MB	2800		50 220 60	300 62 220 60	5 2				10
18	190612	20.0N 143.5E	700MB	2776		65 140 120	210 75 140 70	6 3				11
19	190848	20.4N 143.2E	700MB	2736	958		310 64 230 60	6 3	CIRCULAR	20	+14 +15	11
20	192056	22.5N 143.5E	700MB	2613		50 070 120	250 90 170 30	10 4	CIRCULAR	40	+11 +17 +10	13
21	192343	23.2N 143.8E	700MB	2616		70 270 20	320 70 230 30	10 4				13
22	200605	24.8N 144.8E	700MB	2616		70 320 10	230 102 140 40	5 5				14
23	200844	25.2N 145.3E	700MB	2609	944		300 96 150 30	5 5	ELLIPTICAL	50 40 040	+15 +18 +18	14
24	202040	28.0N 147.7E	700MB	2555	939	90 060 5	240 90 150 30	5 2	ELLIPTICAL	50 30 050	+14 +20 +13	15
25	202254	28.5N 148.6E	700MB	2573		90 170 30	210 95 170 25	5 3	CIRCULAR	60		15
26	210704	30.1N 150.9E	700MB	2655	950	55 110 135	200 84 120 200	10 5			+11 +19 +11	16
27	210940	30.5N 151.0E	700MB	2679			290 74 210 113	4 5				16

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON PAMELA
BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		WIND	WARNING POSIT		WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT		WIND	ERRORS DST	ERRORS WIND
112118Z	7.6	176.7	15	0.0	0.0	0.	-0.	5.	0.0	0.0	0.	-0.	9.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112200Z	7.0	177.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112206Z	7.0	177.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112212Z	7.5	178.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112218Z	8.0	177.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112300Z	8.0	177.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112306Z	7.8	176.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112312Z	7.6	176.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112318Z	7.3	175.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112400Z	7.1	175.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112406Z	6.9	174.8	30	6.8	174.8	30.	6.	0.	6.2	172.6	35.	106.	-15.	6.4	169.9	45.	177.	-20.	6.9	167.2	55.	334.	-40.
112412Z	6.8	174.2	35	6.8	174.2	30.	0.	-5.	7.1	171.3	40.	59.	-15.	8.0	169.1	50.	181.	-20.	9.3	167.1	65.	318.	-35.
112418Z	6.9	173.3	45	6.8	173.5	40.	13.	-5.	7.6	170.5	55.	40.	0.	8.8	168.8	60.	224.	-15.	10.2	166.7	70.	346.	-30.
112500Z	7.2	172.3	50	7.1	172.3	45.	6.	5.	9.2	168.3	60.	76.	0.	11.2	164.9	70.	88.	-15.	12.8	162.1	70.	121.	-25.
112506Z	7.4	171.3	50	7.5	171.3	50.	6.	0.	9.6	167.5	70.	68.	5.	11.6	164.0	80.	92.	-15.	13.2	161.3	70.	90.	-25.
112512Z	7.5	170.4	55	7.4	170.3	55.	8.	0.	8.7	166.5	70.	32.	0.	10.0	163.2	80.	93.	-15.	11.5	160.4	75.	119.	-20.
112518Z	7.6	169.7	55	7.4	169.7	60.	12.	5.	8.2	165.9	75.	96.	0.	9.5	162.4	80.	151.	-20.	10.9	159.7	75.	159.	-25.
112600Z	8.0	168.7	60	7.5	168.8	60.	31.	0.	8.7	165.0	75.	119.	-10.	10.0	163.5	80.	228.	-15.	10.7	158.7	80.	181.	10.
112606Z	8.5	167.8	65	8.4	167.7	65.	8.	0.	9.9	164.6	80.	107.	-15.	10.5	161.0	80.	101.	-15.	10.0	156.9	90.	190.	35.
112612Z	9.2	166.3	70	8.9	166.7	65.	30.	-5.	10.7	162.9	80.	56.	-15.	11.3	158.8	80.	111.	-15.	11.7	154.3	90.	234.	40.
112618Z	9.6	165.1	75	9.8	165.2	70.	13.	-5.	11.1	160.5	80.	42.	-20.	11.5	155.6	85.	219.	-15.	11.6	151.9	90.	322.	35.
112700Z	9.9	164.2	85	10.3	163.8	75.	34.	-10.	12.2	159.8	85.	26.	-10.	12.5	156.1	85.	152.	15.	12.7	153.4	85.	160.	25.
112706Z	10.5	162.9	95	10.5	162.9	100.	0.	5.	11.9	158.6	130.	80.	35.	12.7	155.4	125.	174.	70.	12.9	151.8	120.	184.	60.
112712Z	11.0	162.0	95	11.0	161.7	110.	18.	15.	12.2	157.6	130.	108.	35.	12.8	154.4	125.	208.	75.	13.2	150.8	120.	179.	65.
112718Z	11.6	161.0	100	11.7	160.8	110.	13.	10.	12.8	156.4	130.	145.	30.	13.0	153.2	125.	234.	70.	13.2	149.6	120.	173.	70.
112800Z	12.0	160.2	95	11.9	160.2	90.	6.	-5.	13.1	156.2	100.	133.	30.	13.5	152.7	100.	211.	40.	13.5	148.9	90.	128.	40.
112806Z	12.7	159.7	95	12.3	159.4	100.	30.	5.	13.5	155.5	105.	158.	50.	13.8	151.1	110.	242.	50.	13.8	146.8	115.	123.	70.
112812Z	13.1	159.2	95	12.8	159.1	100.	19.	5.	14.0	155.5	105.	144.	55.	14.5	151.4	110.	212.	55.	14.2	146.8	115.	158.	70.
112818Z	13.4	158.8	100	12.9	158.3	100.	42.	0.	13.7	154.8	105.	146.	50.	14.1	150.5	110.	182.	60.	14.1	146.0	115.	195.	75.
112900Z	13.7	158.4	70	13.8	158.5	100.	8.	30.	15.3	155.3	100.	186.	40.	15.2	151.2	105.	229.	55.	14.7	147.1	110.	378.	75.
112906Z	13.7	158.2	55	14.2	158.2	100.	30.	45.	15.3	155.2	95.	199.	35.	15.2	151.0	100.	268.	55.	14.6	147.0	105.	474.	75.
112912Z	13.4	157.9	50	13.6	157.8	60.	13.	10.	13.2	156.3	60.	203.	5.	13.2	151.4	80.	364.	35.	13.3	144.9	100.	448.	70.
112918Z	13.0	157.2	55	13.4	157.5	55.	30.	0.	12.8	155.5	65.	227.	15.	12.6	150.1	80.	399.	40.	13.6	143.6	100.	451.	65.
113000Z	12.3	156.1	60	12.6	156.2	65.	19.	5.	12.2	151.4	80.	95.	30.	13.2	145.8	80.	277.	51.	15.0	141.4	90.	396.	45.
113006Z	12.0	154.8	60	12.2	155.1	65.	21.	5.	12.1	150.4	60.	153.	35.	13.2	145.2	85.	352.	55.	14.9	140.9	90.	454.	40.
113012Z	11.5	153.3	55	11.8	153.6	65.	25.	10.	11.5	149.8	70.	266.	25.	13.5	144.4	80.	420.	50.	16.1	140.2	90.	467.	40.
113018Z	11.4	151.9	50	11.4	151.9	65.	0.	15.	12.0	147.0	75.	217.	35.	14.6	142.8	85.	413.	50.	17.1	138.3	90.	401.	35.
120100Z	11.6	149.9	50	11.5	150.4	50.	30.	0.	13.0	144.9	45.	223.	10.	14.8	140.3	50.	331.	5.	16.0	135.4	60.	244.	5.
120106Z	12.0	147.8	45	12.2	147.7	50.	13.	5.	14.2	141.1	40.	164.	10.	15.0	135.7	40.	157.	-10.	15.0	131.3	45.	58.	-15.
120112Z	12.0	145.3	45	12.2	145.2	45.	13.	0.	13.2	139.2	40.	121.	10.	13.7	134.3	45.	145.	-5.	15.5	130.9	45.	52.	-20.
120118Z	12.2	143.3	40	12.4	143.4	35.	13.	-5.	15.0	137.7	30.	159.	-5.	17.4	134.7	30.	218.	-25.	0.0	0.0	0.	-0.	0.
120200Z	12.1	141.2	35	12.0	141.3	35.	8.	0.	13.9	133.9	30.	47.	-15.	17.4	128.0	30.	179.	-25.	0.0	0.0	0.	-0.	0.
120206Z	12.1	139.3	30	12.4	139.2	35.	19.	5.	14.3	132.3	30.	47.	-30.	17.2	127.0	25.	226.	-35.	0.0	0.0	0.	-0.	0.
120212Z	12.4	137.3	30	12.2	137.3	35.	12.	5.	14.2	131.8	30.	53.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120218Z	13.0	135.9	35	12.7	135.3	35.	39.	0.	14.1	129.6	30.	137.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120300Z	13.8	134.7	45	13.4	134.2	40.	38.	-5.	15.5	129.1	35.	121.	-20.	17.1	124.5	30.	292.	-50.	18.3	120.3	25.	534.	-30.
120306Z	14.3	133.1	50	14.4	133.2	50.	8.	0.	16.3	128.7	65.	115.	5.	17.8	124.9	55.	273.	-20.	18.8	120.9	50.	476.	0.
120312Z	15.0	132.2	50	14.9	132.0	55.	13.	5.	17.1	127.9	65.	146.	0.	18.5	124.0	50.	309.	-15.	19.0	119.8	45.	508.	-5.
120318Z	15.3	131.6	55	15.4	131.0	55.	35.	0.	16.8	127.3	65.	148.	-5.	17.8	123.7	55.	355.	-5.	18.7	120.0	40.	468.	-20.
120400Z	15.5	131.2	55	15.5	131.1	60.	6.	5.	17.2	129.8	55.	62.	-25.	21.1	130.3	40.	311.	-15.	0.0	0.0	0.	-0.	0.
120406Z	15.7	130.6	60	15.8	130.8	60.	13.	0.	18.9	129.0	45.	158.	-30.	23.9	131.2	35.	547.	-15.	0.0	0.0	0.	-0.	0.
120412Z	15.9	130.1	65	16.0	130.2	65.	8.	0.	19.3	128.8	50.	151.	-15.	25.8	131.1	30.	711.	-20.	0.0	0.0	0.	-0.	0.
120418Z	15.9	129.7	70	16.2	129.7	65.	18.	-5.	19.0	127.8	55.	175.	-5.	24.8	130.8	35.	677.	-25.	0.0	0.0	0.	-0.	0.
120500Z	16.2	129.5	80	16.2	129.3	85.	12.	5.	18.7	127.8	75.	183.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120506Z	16.3	129.4	75	16.3	129.4	85.	0.	10.	18.5	127.8	70.	200.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120512Z	16.8	129.1	65	16.5	129.0	60.	19.	-5.	17.8	127.9	40.	201.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120518Z	16.8	129.8	60	16.8	128.7	55.	63.	-5.	17.8	127.3	40.	233.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120600Z	16.8	129.3	55	17.8	128.4	55.	79.	0.	18.1	126.7	40.	305.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120606Z	15.2	128.3	50	15.2	128.3	50.	0.	0.	14.2	123.8	60.	93.	-5.	14.5	118.8	55.	273.	20.	0.0	0.0	0.	-0.	0.
120612Z	14.5	127.3	50	14.7	127.3	50.	12.	0.	13.8	123.2	50.	124.	0.	13.9	118.3	50.	250.	20.	0.0	0.0	0.	-0.	0.
120618Z	14.0	126.5	60	14.2	126.3	50.	17.	-10.	13.8	121.3	45.	169.	5.	14.3	116.8	55.	258.	25.	0.0	0.0	0.	-0.	0.
120700Z	13.2	125.3	70	13.4	125.3	70.	12.	0.	13.4	120.5	60.	191.	25.	14.5	115.8	65.	260.	40.	0.0	0.0	0.	-0.	0.
120706Z	12.7	124.2	65	12.8	124.3	70.	8.	5.	13.5	119.3	60.	222.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120712Z	11.0	122.7	50	12.0	122.8	60.	60.	10.	13.3	118.3	65.	216.	35.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120718Z	11.0	121.9	40	13.2	121.7	50.	130.	10.	13.6	117.8	50.	238.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120800Z	10.4	119.5	35	10.8	119.4	40.	25.	5.	11.0	114.3	35.	72.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120806Z	10.0	118.1	35	9.9	118.1	30.	6.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120812Z	9.9	117.1	30	9.6	116.8	30.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120818Z	10.0	116.1	30	10.0	116.2	30.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120900Z	10.2	115.2	25	10.2	115.2	25.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	20.	139.	263.	280.	21.	136.	258.	269.
AVG RIGHT ANGLE ERROR	14.	79.	149.	140.	15.	74.	145.	141.
AVG INTENSITY MAGNITUDE ERROR	5.	19.	31.	39.	6.	19.	30.	37.
AVG INTENSITY BIAS	3.	6.	11.	22.	3.	5.	8.	19.
NUMBER OF FORECASTS	60	56	45	34	54	51	40	32

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 4291. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 10. KNOTS

TYPHOON PAMELA
FIX POSITIONS FOR CYCLONE NO. 27

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	COMMENTS	SITE
1	210300	8.6N 176.6E	PCN 6	T1.0/1.0	INIT OBS ULCC FIX	PGTW
2	210319	8.2N 176.7E	PCN 6	T1.0/1.0	INIT OBS ULAC 8.8N 176.1E	KGWC
3	211604	8.5N 176.6E	PCN 6		ULAC 8.9N 175.9E	KGWC
4	220300	6.9N 178.1E	PCN 6	T1.0/1.0 /S0.0/24HRS		PGTW
5	220307	8.0N 178.1E	PCN 4	T2.0/2.0 /D1.0/24HRS	ULAC 8.0N 177.5E	KGWC
6	221200	7.5N 177.9E	PCN 6			PGTW
7	221551	8.3N 177.5E	PCN 6		ULAC 8.6N 177.2E	KGWC
8	221600	8.3N 177.6E	PCN 6			PGTW
9	230000	7.9N 177.6E	PCN 4			PGTW
10	230254	8.2N 176.9E	PCN 4	T2.0/2.0 /S0.0/24HRS	EXP LLCC	KGWC
11	230300	8.1N 177.1E	PCN 4	T1.0/1.0-/S0.0/24HRS		PGTW
12	230600	8.2N 176.7E	PCN 6			PGTW
13	230833	7.8N 176.3E	PCN 6		ULAC 9.4N 174.8E	KGWC
14	231200	7.7N 176.1E	PCN 6			PGTW
15	231539	7.4N 175.4E	PCN 6			KGWC
16	231600	7.5N 176.2E	PCN 6			PGTW
17	231931	7.0N 175.3E	PCN 4	T2.5/2.5 /D0.5/16HRS		KGWC
18	232100	7.5N 175.5E	PCN 6			PGTW
19	240000	7.0N 175.3E	PCN 6	T2.0/2.0-/D1.0/21HRS		PGTW
20	240242	7.1N 174.3E	PCN 6	T3.0/3.0 /D0.5/06HRS	ULAC 7.1N 173.7E	KGWC
21	240300	6.9N 175.1E	PCN 6			PGTW
22	240600	6.9N 174.7E	PCN 6		ULCC 7.3N 174.3E	PGTW
23	240809	6.8N 174.5E	PCN 6		ULAC 6.4N 174.1E	KGWC
24	240900	6.9N 174.5E	PCN 6			PGTW
25	241200	7.0N 174.3E	PCN 6			PGTW
26	241527	6.6N 172.9E	PCN 6		ULAC 6.6N 173.2E	KGWC
27	241600	6.8N 173.7E	PCN 6		ULCC FIX	PGTW
28	241800	6.9N 173.2E	PCN 6		ULCC FIX	PGTW
29	242040	6.8N 171.9E	PCN 5	T4.0/4.0+/D1.0/18HRS		KGWC
30	242049	7.0N 172.5E	PCN 6		ULCC FIX	PGTW
31	250000	7.3N 172.3E	PCN 4	T3.5/3.5 /D1.5/24HRS		PGTW
32	250300	7.3N 171.0E	PCN 4			PGTW
33	250412	7.2N 171.5E	PCN 6			KGWC
34	250600	7.2N 171.2E	PCN 6			PGTW
35	250746	6.8N 170.4E	PCN 6			KGWC
36	250900	6.8N 170.9E	PCN 6			PGTW
37	251200	7.3N 170.7E	PCN 6		ULCC FIX	PGTW
38	251515	7.3N 169.9E	PCN 6			KGWC
39	251600	7.3N 169.9E	PCN 6			PGTW
40	251800	7.4N 169.6E	PCN 6			PGTW
41	252024	7.6N 169.3E	PCN 1	T4.5/4.5 /D0.5/24HRS		KGWC
42	252100	7.6N 169.2E	PCN 6		ULCC FIX	PGTW
43	260000	8.0N 168.8E	PCN 4	T4.0/4.0 /D0.5/24HRS		PGTW
44	260300	8.2N 168.3E	PCN 4			PGTW
45	260400	8.3N 168.1E	PCN 3			PGTW
46	260400	8.2N 167.8E	PCN 1			KGWC
47	260600	8.4N 167.8E	PCN 4			PGTW
48	260900	8.6N 167.6E	PCN 4			PGTW
49	260906	8.9N 167.0E	PCN 6			KGWC
50	261200	9.1N 166.4E	PCN 6			PGTW
51	261600	9.5N 165.7E	PCN 4			PGTW
52	261645	9.5N 165.4E	PCN 2			PGTW
53	261645	9.5N 165.2E	PCN 2			KGWC
54	261800	9.6N 165.3E	PCN 2			PGTW
55	262000	9.8N 164.4E	PCN 2	T5.5/5.5 /D1.0/24HRS		KGWC
56	262100	9.7N 164.7E	PCN 2			PGTW
57	270000	10.0N 164.1E	PCN 2	T4.5/4.5 /D0.5/24HRS	EYE OPEN SE	PGTW
58	270340	10.3N 163.3E	PCN 2			PGTW
59	270600	10.5N 163.0E	PCN 2			PGTW
60	270900	10.7N 162.6E	PCN 2			PGTW
61	271200	11.0N 162.1E	PCN 2			PGTW
62	271600	11.4N 161.4E	PCN 2			PGTW
63	271800	11.6N 161.2E	PCN 2			PGTW
64	272118	11.7N 161.0E	PCN 3			PGTW
65	280000	11.7N 160.1E	PCN 2	T5.5/5.5 /D1.0/24HRS		PGTW
66	280336	12.3N 159.8E	PCN 2		EYE DIA 35NM	PGTW
67	280600	12.4N 159.6E	PCN 2			PGTW
68	280900	12.5N 159.5E	PCN 4			PGTW
69	281200	12.5N 159.0E	PCN 6		ULCC FIX	PGTW
70	281600	12.6N 158.8E	PCN 6			PGTW
71	281800	13.1N 158.7E	PCN 6			PGTW
72	282054	13.5N 158.7E	PCN 3			PGTW
73	290000	13.7N 158.4E	PCN 2	T4.5/5.0+/W1.0/24HRS		PGTW
74	290300	13.6N 158.3E	PCN 4			PGTW
75	290600	13.7N 158.2E	PCN 6			PGTW
76	290900	13.7N 158.2E	PCN 6		ULCC FIX	PGTW
77	291200	13.7N 157.8E	PCN 6			PGTW
78	291600	13.4N 157.7E	PCN 6		ULAC FIX	PGTW
79	291600	13.4N 157.7E	PCN 5		ULAC FIX	PGTW
80	291800	13.3N 157.6E	PCN 6		ULAC FIX	PGTW
81	292100	13.0N 157.2E	PCN 6			PGTW
82	300000	12.4N 156.8E	PCN 4	T3.5/4.0+/W1.0/24HRS	EXP LLCC	PGTW
83	300300	12.4N 155.5E	PCN 6			PGTW

84	300453	12.3N 155.2E	PCN 5			PGTW
85	300600	12.2N 155.1E	PCN 6			PGTW
86	300909	11.9N 154.1E	PCN 6			PGTW
87	301200	11.5N 153.5E	PCN 4		ULAC 12.1N 155.6E	PGTW
88	301600	11.5N 152.5E	PCN 4		EXP LLCC	PGTW
89	301730	11.7N 152.0E	PCN 3			PGTW
90	301800	11.7N 152.0E	PCN 4			PGTW
91	302100	11.8N 151.1E	PCN 4			PGTW
92	302140	11.7N 151.1E	PCN 5			PGTW
93	010000	11.8N 150.3E	PCN 6			PGTW
94	010300	12.0N 148.9E	PCN 6			PGTW
95	010441	12.1N 148.2E	PCN 3	T3.0/3.0+/W0.5/20HRS		PGTW
96	010600	12.1N 147.4E	PCN 4			PGTW
97	010900	12.2N 146.1E	PCN 6			PGTW
98	011200	12.2N 145.2E	PCN 4			PGTW
99	011600	11.9N 144.1E	PCN 6		ULCC FIX	PGTW
100	011800	12.0N 143.2E	PCN 6		ULCC FIX	PGTW
101	012100	12.0N 141.7E	PCN 6		ULCC FIX	PGTW
102	012305	12.0N 141.8E	PCN 5			PGTW
103	020000	12.0N 141.5E	PCN 4			PGTW
104	020300	12.3N 140.3E	PCN 4	T1.5/2.5 /W1.5/22HRS	EXP LLCC	PGTW
105	020300	12.0N 140.1E	PCN 4	T2.0/2.0+	INIT OBS	RPMK
106	020611	12.0N 139.2E	PCN 3		EXP LLCC	PGTW
107	020900	12.1N 138.5E	PCN 6			PGTW
108	021200	12.0N 137.2E	PCN 6		ULCC FIX	PGTW
109	021600	12.8N 136.0E	PCN 6			PGTW
110	021800	13.2N 135.3E	PCN 6		ULCC FIX	PGTW
111	022100	13.5N 134.8E	PCN 6			PGTW
112	022241	13.5N 134.6E	PCN 5			PGTW
113	030000	13.6N 134.7E	PCN 6			PGTW
114	030300	13.8N 134.1E	PCN 6	T3.0/3.0 /D1.5/24HRS		PGTW
115	030559	14.4N 133.4E	PCN 5		ULAC FIX	PGTW
116	030900	14.7N 132.8E	PCN 6		ULAC FIX	PGTW
117	031200	15.0N 132.1E	PCN 6			PGTW
118	031600	15.2N 131.6E	PCN 6			PGTW
119	031800	15.3N 131.4E	PCN 6			PGTW
120	031843	15.4N 131.3E	PCN 5			PGTW
121	032100	15.4N 131.3E	PCN 6			PGTW
122	032217	15.3N 131.5E	PCN 3			RPMK
123	040000	15.6N 131.3E	PCN 6		ULAC FIX	PGTW
124	040300	16.0N 130.7E	PCN 4	T4.0/4.0-/D1.0/24HRS	ULAC FIX	PGTW
125	040546	16.3N 130.8E	PCN 5		ULAC FIX	PGTW
126	040600	16.3N 130.8E	PCN 6		ULAC FIX	PGTW
127	040900	15.9N 130.5E	PCN 6		ULAC FIX	PGTW
128	041200	15.8N 130.2E	PCN 4			PGTW
129	041600	15.9N 129.8E	PCN 2			PGTW
130	041831	16.0N 129.6E	PCN 1			PGTW
131	042100	16.0N 129.6E	PCN 2			PGTW
132	042335	16.0N 129.9E	PCN 1	T5.0/5.0	INIT ODS	RODN
133	050000	16.2N 129.5E	PCN 2			PGTW
134	050300	16.2N 129.4E	PCN 2	T5.0/5.0-/D1.0/24HRS		PGTW
135	050534	16.1N 129.4E	PCN 1			PGTW
136	050600	16.4N 129.6E	PCN 2			PGTW
137	050900	16.7N 129.6E	PCN 6		ULAC FIX	PGTW
138	051200	16.7N 129.3E	PCN 6			PGTW
139	051600	16.8N 129.8E	PCN 6		ULCC FIX	PGTW
140	051800	17.1N 128.9E	PCN 6		ULCC FIX	PGTW
141	052100	16.7N 130.5E	PCN 6		BRKS CONTINUITY	PGTW
142	052310	16.4N 129.7E	PCN 5	T4.0/5.0 /W1.0/24HRS	ULCC FIX	RODN
143	060000	15.7N 129.3E	PCN 6		ULAC 16.0N 128.4E	PGTW
144	060300	13.6N 129.0E	PCN 6	T3.5/4.5-/W1.5/24HRS		PGTW
145	060552	15.5N 128.3E	PCN 6			PGTW
146	060600	15.3N 128.2E	PCN 6			PGTW
147	060900	14.8N 127.7E	PCN 6		ULAC FIX	PGTW
148	061200	14.9N 127.1E	PCN 6			PGTW
149	061600	14.5N 126.2E	PCN 6			PGTW
150	061807	14.3N 126.2E	PCN 5			PGTW
151	062100	13.8N 125.7E	PCN 6			PGTW
152	062247	13.3N 125.7E	PCN 1	T4.0/4.0-	INIT OBS	RPMK
153	070000	13.3N 125.3E	PCN 4			PGTW
154	070300	13.3N 125.0E	PCN 6			PGTW
155	070600	13.0N 124.8E	PCN 4	T4.0/4.5-/D0.5/27HRS		PGTW
156	070652	13.1N 123.9E	PCN 5			RPMK
157	070900	13.0N 123.2E	PCN 6			PGTW
158	071200	13.0N 122.6E	PCN 6			PGTW
159	071537	10.3N 120.7E	PCN 3		EXP LLCC	RPMK
160	080004	9.0N 119.6E	PCN 3			RPMK

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	251915	7.5N 169.4E	700MB	2959		45 200 10	330 36 200 10	7 3				1
2	252016	7.7N 169.2E	700MB	2963	985	60 130 15	200 46 120 30	7 4	ELLIPTICAL	10 12 120	+11 +14 + 9	1
3	260625	8.5N 167.6E	700MB	2099	980		340 36 230 40	7 3	CIRCULAR	12	+13 +14 +13	2
4	260844	8.8N 167.0E	700MB	2094			200 73 110 5	5 2	CIRCULAR	5	+13 +16 +12	2
5	261826	9.6N 164.9E	700MB	2817		25 100 120	050 72 340 10	7 2	CIRCULAR	22		3
6	262055	9.8N 164.5E	700MB	2016	967	70 170 7	050 72 310 7	5 2	CIRCULAR	25	+12 +17 +12	3
7	270630	10.5N 162.0E	700MB	2585	940	90 020 8	110 75 020 30	10 2	CIRCULAR	12	+15 +19 +12	5
8	270907	10.8N 162.3E	700MB	2577			300 53 200 30	5 2	CIRCULAR	15	+14 +18 +12	5
9	271055	11.6N 160.9E	700MB	2647			170 98 090 30	10 2	CIRCULAR	15		6
10	272119	11.7N 160.6E	700MB	2673	953	50 350 40	070 77 320 15	10 2	CIRCULAR	20	+11 +15 +12	6
11	280027	12.0N 159.7E	700MB	2642	947		240 109 170 20	12 5	CIRCULAR	35	+13 +18 +10	9
12	281126	13.0N 159.2E	700MB	2653			100 107 090 20	11 10				9
13	282105	13.5N 158.7E	700MB	2630	950	110 150 10	210 110 150 15	7 3	CIRCULAR	15	+12 +20 + 9	10
14	290008	13.7N 158.4E	700MB	2786		70 100 10	150 100 040 10	7 3				10
15	290640	13.7N 158.1E	700MB	2914	979	50 200 30	200 75 210 14	5 5	CIRCULAR	40	+20 +21 +12	12
16	290920	13.6N 158.0E	700MB	2967			020 55 290 50	10 8			+13 +17 +11	12
17	292126	12.8N 156.5E	700MB	3016	992	75 220 12	020 47 280 28	8 5			+14 +16 + 7	13
18	300022	12.3N 156.0E	700MB	3029		80 360 70	120 59 360 21	6 6				13
19	300813	11.9N 154.2E	700MB	3056	990		020 58 270 45	10 5			+11 +17 + 5	14
20	301104	11.5N 153.5E	700MB	3073			000 63 330 130	10 5			+18 + 4	14
21	302127	11.5N 150.8E	700MB		1002	35 000 100	200 26 090 30	8 3			+13 +12 + 6	16
22	010013	11.7N 149.7E	700MB	3102		55 270 10	100 54 040 70	8 3				16
23	010626	11.9N 147.6E	700MB	3075	999	45 310 17	060 53 320 127	6 4				17
24	010903	11.6N 146.0E	700MB	3102			120 54 360 135	6 3			+10 +10 + 7	17
25	011532	12.1N 143.8E	700MB	3083			060 29 300 30	10 3			+13	18
26	012150	12.2N 142.0E	700MB		990	35 360 10	150 48 040 15	10 5			+13 + 7	18
27	020850	12.2N 138.2E	850MB				000 44 100 60	10 5			+19 +15	19
28	021155	12.5N 137.4E	850MB				140 54 040 30	10 5				19
29	022126	13.4N 135.1E	700MB	3058	990	50 310 15	040 39 310 30	10 5			+10 +12 + 9	20
30	030019	13.8N 134.5E	700MB	3020		45 270 7	150 54 060 40	10 5				20
31	030603	14.4N 133.2E	700MB	3010	989	55 320 8	160 55 090 13	10 3				21
32	030853	14.6N 132.8E	700MB	2964	983	35 260 10	230 28 140 60	10 2			+12 +19 + 8	21
33	032135	15.4N 131.3E	700MB	3002	988	60 050 30	150 57 050 55	10 3	ELLIPTICAL	20 10 100	+17 + 9	22
34	040034	15.5N 131.1E	700MB	3006		55 290 15	020 59 200 7	10 3			+16 + 9	22
35	040841	15.8N 130.4E	700MB	2947	983	65 300 5	120 69 030 20	5 5	CIRCULAR	20	+18 +15 +10	23
36	041127	15.9N 130.2E	700MB	2922			300 62 240 10	12 5			+18 +17 + 8	23
37	042100	15.9N 129.7E	700MB	2769			300 90 210 7	6 2	CIRCULAR	15	+16 +19 + 8	24
38	042332	16.1N 129.5E	700MB	2744	958	90 310 7	360 94 310 10	4 2	CIRCULAR	10	+16 +24 + 5	24
39	050602	16.3N 129.4E	700MB	2871		80 270 10	330 90 200 10	10 3			+22 + 8	25
40	050840	16.4N 129.2E	700MB	2984	985	60 290 15	350 63 290 15	10 5			+21 + 5	25
41	060633	15.2N 128.2E	700MB	3014		50 300 12	190 47 100 6	10 3			+12 +12	27
42	060903	14.8N 127.8E	700MB	2977	987	50 300 5	350 43 270 10	10 2	ELLIPTICAL	8 6 020	+13 +13 +12	27
43	062156	13.5N 126.0E	700MB	3004	994	60 250 5	100 62 360 5	5 2	ELLIPTICAL	15 10 010	+14 +15 + 6	28
44	070032	13.2N 125.2E	700MB	3044		80 360 5	170 55 000 10	5 3				28

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	260330	8.2N 167.9E	LAND	FAIR					8.7N 167.7E	91366
2	260430	8.3N 167.8E	LAND	FAIR					8.7N 167.7E	91366
3	260930	8.8N 167.0E	LAND	FAIR					8.7N 167.7E	91366
4	261030	9.0N 166.8E	LAND	FAIR					8.7N 167.7E	91366
5	261130	9.1N 166.4E	LAND	FAIR					8.7N 167.7E	91366
6	261230	9.2N 166.2E	LAND	POOR					8.7N 167.7E	91366
7	011250	12.3N 145.1E	LAND	FAIR					13.6N 144.9E	91218
8	011345	12.3N 144.8E	LAND	FAIR					13.6N 144.9E	91218
9	011435	12.4N 144.4E	LAND	POOR					13.6N 144.9E	91218
10	011535	12.6N 144.2E	LAND	POOR					13.6N 144.9E	91218
11	061400	14.4N 127.0E	LAND				35220 42215		14.0N 124.3E	98447
12	061500	14.2N 127.0E	LAND				35210 41011		14.0N 124.3E	98447
13	061600	14.2N 126.9E	LAND				10331 42406		14.0N 124.3E	98447
14	061700	14.1N 126.7E	LAND				10221 42400		14.0N 124.3E	98447
15	061800	14.1N 126.4E	LAND				10211 52410	EYE CIRCULAR	14.0N 124.3E	98447
16	061900	13.8N 126.2E	LAND				10211 52219	EYE CIRCULAR	14.0N 124.3E	98447
17	070000	13.4N 125.4E	LAND				10331 52707	EYE CIRCULAR	14.0N 124.3E	98447
18	070600	12.6N 124.1E	LAND				10432 42710		14.0N 124.3E	98447
19	070700	12.5N 123.9E	LAND				10412 42510		14.0N 124.3E	98447
20	070800	12.4N 123.7E	LAND				10412 42610		14.0N 124.3E	98447
21	071100	11.9N 122.9E	LAND				10312 42713		14.0N 124.3E	98447
22	071800	11.0N 122.8E	LAND				10312 42512		14.0N 124.3E	98447

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	250420	7.3N 171.8E	050	025	WMO 91376
2	260610	8.5N 167.7E	065	015	WMO 91366 KWAJALEIN
3	070900	12.2N 123.3E	045	016	WMO 98543

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ROGER
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
120706Z	10.1	130.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120712Z	10.8	129.1	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120718Z	11.5	127.2	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120800Z	12.4	125.5	50	11.0	125.7	50.	30.	0.	13.5	120.3	45.	134.	-20.	13.3	116.8	55.	433.	15.	0.0	0.0	0.	-0.	0.
120806Z	13.2	124.2	55	12.8	124.2	50.	24.	-5.	13.8	119.0	50.	202.	-15.	14.0	114.2	55.	549.	25.	0.0	0.0	0.	-0.	0.
120812Z	13.8	123.3	55	14.2	123.6	55.	30.	0.	16.3	120.0	50.	127.	-10.	18.4	118.1	35.	243.	10.	0.0	0.0	0.	-0.	0.
120818Z	14.5	122.4	60	14.4	122.4	60.	6.	0.	16.9	119.3	45.	105.	-5.	18.8	117.0	35.	307.	10.	0.0	0.0	0.	-0.	0.
120900Z	15.0	122.0	65	15.1	122.0	65.	6.	0.	17.4	119.5	50.	175.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120906Z	15.8	121.8	65	15.6	121.5	65.	21.	0.	17.9	119.8	50.	158.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120912Z	16.5	122.2	60	16.4	122.2	60.	6.	0.	18.8	122.4	45.	25.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
120918Z	17.3	122.5	50	17.4	122.4	55.	8.	5.	19.8	122.8	45.	29.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121000Z	18.0	122.5	40	17.8	122.8	55.	21.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121006Z	18.5	122.5	30	18.5	122.5	30.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121012Z	19.2	122.3	25	18.7	122.4	30.	31.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121018Z	19.9	122.3	25	19.8	122.2	25.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	17.	129.	383.	0.	18.	165.	433.	0.
AVG RIGHT ANGLE ERROR	12.	116.	329.	0.	15.	148.	319.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	15.	15.	0.	3.	12.	15.	0.
AVG INTENSITY BIAS	2.	3.	15.	0.	2.	-8.	15.	0.
NUMBER OF FORECASTS	12	8	4	0	9	5	1	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 906. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 11. KNOTS

TYPHOON ROGER
FIX POSITIONS FOR CYCLONE NO. 28

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	041800	5.3N	145.3E	PCN 6		ULCC FIX	PGTW
2	050000	6.0N	145.7E	PCN 6	T1.0/1.0	INIT OBS	PGTW
3	050300	4.4N	142.2E	PCN 4			PGTW
4	050534	4.0N	141.7E	PCN 3			PGTW
5	050600	4.0N	141.7E	PCN 4			PGTW
6	050900	4.3N	141.1E	PCN 6		ULAC FIX	PGTW
7	051200	4.7N	141.0E	PCN 6		ULCC FIX	PGTW
8	051600	5.3N	138.9E	PCN 6		ULCC FIX	PGTW
9	060000	7.4N	137.5E	PCN 6	T0.5/0.5 /W0.5/24HRS		PGTW
10	060300	7.7N	137.1E	PCN 6			PGTW
11	071000	11.2N	127.0E	PCN 6		ULCC FIX	PGTW
12	072100	11.3N	126.6E	PCN 6			PGTW
13	080000	12.6N	126.0E	PCN 4	T3.5/3.5-	INIT OBS	PGTW
14	080004	12.1N	126.0E	PCN 3	T3.0/3.0	INIT OBS	RPMK
15	080300	12.6N	124.0E	PCN 6			PGTW
16	080600	13.4N	124.5E	PCN 4			PGTW
17	080639	13.2N	124.1E	PCN 3			RPMK
18	080900	13.0N	124.4E	PCN 6			PGTW
19	081200	14.1N	123.9E	PCN 6			PGTW
20	081600	14.5N	122.9E	PCN 4			PGTW
21	081800	14.7N	122.6E	PCN 4			PGTW
22	081924	14.5N	122.3E	PCN 3			RPMK
23	082100	14.8N	122.2E	PCN 2			PGTW
24	082340	15.0N	122.2E	PCN 1	T4.5/4.5 /D1.5/24HRS		RPMK
25	090000	15.0N	122.1E	PCN 2	T4.5/4.5-/D1.0/24HRS		PGTW
26	090300	15.3N	121.8E	PCN 2			PGTW
27	090627	15.6N	121.7E	PCN 3			PGTW
28	090900	16.0N	121.7E	PCN 4			PGTW
29	090900	15.9N	122.1E	PCN 2			RPMK
30	091200	16.4N	121.9E	PCN 6			PGTW
31	091600	17.1N	122.4E	PCN 6			PGTW
32	091800	17.4N	122.5E	PCN 6			PGTW
33	091912	16.7N	123.0E	PCN 3		EXP LLCC	RPMK
34	091912	17.2N	122.5E	PCN 6			RODN

35	092100	17.7N 122.8E	PCN 6			PGTW
* 36	092316	17.5N 124.2E	PCN 5	T3.5/4.5-/W1.0/24HRS		RPMK
37	100000	17.7N 123.4E	PCN 6	T3.0/4.0-/W1.5/24HRS	ULCC FIX	PGTW
* 38	100300	17.5N 124.0E	PCN 6		ULCC FIX	PGTW
39	100615	18.6N 122.5E	PCN 5			PGTW
40	101000	19.8N 122.2E	PCN 4			PGTW
41	102100	20.1N 122.4E	PCN 4		EXP LLCC	PGTW
42	110000	20.5N 122.7E	PCN 4	T0.5/1.5 /W2.5/24HRS	EXP LLCC	PGTW
43	110300	20.8N 122.9E	PCN 4			PGTW
44	110603	21.3N 123.3E	PCN 3		EXP LLCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	072349	12.0N 125.9E	700MB	3099	1002	50 270 10	160 65 000 10	10 3			+12 + 8	1
2	100627	18.5N 122.5E	700MB	3113		30 240 9	200 34 090 120	5 3			+15 + 7	2
3	100917	18.6N 122.4E	700MB	3123	1004	25 360 20	100 15 360 150	3 2			+11 +13 + 6	2

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	000400	12.8N 125.0E	LAND				10402 50000		14.0N 124.3E	98447
2	000800	13.6N 124.5E	LAND				10422 42710		14.0N 124.3E	98447
3	000930	13.7N 123.8E	LAND				10433 42911		14.0N 124.3E	98447
4	001000	13.8N 123.8E	LAND				25/43 42909		14.0N 124.3E	98447
5	001100	13.6N 123.7E	LAND				20/21 62203		14.1N 123.0E	98440
6	001200	13.8N 123.4E	LAND				10121 43222		14.1N 123.0E	98440
7	001300	13.9N 123.4E	LAND				20/31 40000		14.1N 123.0E	98440
8	001400	14.4N 123.2E	LAND				20/21 43211		14.1N 123.0E	98440
9	001600	14.5N 122.6E	LAND				11131 42709		14.1N 123.0E	98440
10	001700	14.6N 122.4E	LAND				22131 42707		14.1N 123.0E	98440
11	001700	14.7N 122.5E	LAND				1063/ 40000	EYE 100 PCT CIR DIA 35KMS	16.3N 120.6E	98321
12	001730	14.7N 122.5E	LAND				1063/ 42802	EYE 90 PCT CIR DIA 35KMS OPN SE	16.3N 120.6E	98321
13	001800	14.7N 122.4E	LAND				1179/ 42702	EYE 100 PCT ELPTCL DIA 40/30KMS	16.3N 120.6E	98321
14	001900	14.7N 122.3E	LAND				1179/ 40000	EYE 100 PCT ELPTCL DIA 40/30KMS	16.3N 120.6E	98321
15	090100	15.2N 121.9E	LAND				10312 42902		16.3N 120.6E	98321
16	090400	15.5N 121.8E	LAND				10222 43602		16.3N 120.6E	98321
17	090730	15.9N 122.0E	LAND				10412 40303		16.3N 120.6E	98321
18	090830	16.0N 122.1E	LAND				10412 40304		16.3N 120.6E	98321
19	090900	16.1N 122.1E	LAND				10412 40204		16.3N 120.6E	98321
20	091130	16.5N 122.3E	LAND				10411 40103		16.3N 120.6E	98321
21	091200	16.6N 122.3E	LAND				1041/ 40104		16.3N 120.6E	98321
22	091230	16.7N 122.3E	LAND				1041/ 40104		16.3N 120.6E	98321
23	091400	16.9N 122.3E	LAND				1051/ 50204		16.3N 120.6E	98321
24	091430	17.0N 122.3E	LAND				1041/ 43604		16.3N 120.6E	98321
25	091500	17.0N 122.3E	LAND				1041/ 40000	EYE 90 PCT CIR OPEN NE	16.3N 120.6E	98321

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	000900	13.5N 123.8E	055	020	WMO 98444, 98447
2	001400	14.0N 122.9E	050	005	WMO 98440
3	090300	15.4N 121.6E	050	030	WMO 98333

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

2. NORTH INDIAN OCEAN TROPICAL CYCLONES

TROPICAL CYCLONE 20-82
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
043002Z	11.4	82.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
043008Z	12.0	82.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
043014Z	12.7	82.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
043020Z	13.5	82.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050102Z	14.3	82.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050108Z	14.8	82.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050114Z	15.3	82.8	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050120Z	15.8	83.3	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050202Z	16.2	83.8	40	16.2	82.8	25.	58.	-15.	17.8	84.1	40.	159.	-40.	19.0	86.2	50.	304.	-70.	19.8	89.3	60.	448.	10.
050208Z	16.4	84.4	50	16.7	83.8	30.	39.	-20.	17.9	86.9	45.	55.	-45.	18.6	90.1	55.	194.	-70.	19.0	93.4	65.	232.	30.
050214Z	16.8	85.2	60	16.8	84.8	60.	23.	0.	18.1	86.9	70.	122.	-30.	18.8	89.2	70.	330.	-25.	0.0	0.0	0.	-0	0.
050220Z	17.0	85.9	70	17.0	85.2	65.	10.	-5.	18.1	87.0	75.	186.	-35.	19.1	89.3	80.	183.	10.	0.0	0.0	0.	-0.	6.
050302Z	17.2	86.8	80	17.3	86.8	65.	6.	-15.	18.2	89.5	75.	111.	-45.	19.0	92.2	85.	277.	35.	0.0	0.0	0.	-0.	0.
050308Z	17.4	87.7	90	17.5	87.8	75.	8.	-15.	18.1	90.9	85.	142.	-40.	18.6	94.1	75.	189.	40.	0.0	0.0	0.	-0.	0.
050314Z	17.4	88.9	100	17.6	88.7	85.	17.	-15.	18.1	92.0	85.	165.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050320Z	17.5	90.2	110	17.7	89.8	95.	26.	-15.	17.8	94.2	90.	115.	20.	0.0	0.0	0.	-0.	0	0.0	0.0	0.	-0.	0.
050402Z	17.5	91.3	120	17.4	91.2	120.	8.	0.	17.7	95.6	90.	75.	40.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
050408Z	17.5	93.3	125	17.5	93.8	130.	17.	5.	17.8	98.2	40.	52.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050414Z	17.4	94.8	95	17.5	94.9	100.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050420Z	17.6	96.2	70	17.5	95.9	65.	18.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050502Z	17.8	96.9	50	17.4	97.2	50.	30.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
050508Z	18.2	97.4	35	17.0	97.2	35.	27.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48 HR	72 HR
AVG FORECAST POSIT ERROR	23.	118.	283.	340.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	14.	43.	87.	116.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	8.	31.	42.	20.	0.	0.	0.	0.
AVG INTENSITY BIAS	-7.	-18.	-13.	20.	0.	0.	0.	0.
NUMBER OF FORECASTS	14	10	6	2	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 1135. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TC20-82
FIX POSITIONS FOR CYCLONE NO. 20

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	240820	4.3N	89.2E	PCN 5	T1.0/1.0	INIT OBS ULAC 2.4N 90.7E	KGWC
* 2	242115	4.7N	86.9E	PCN 6		ULAC 2.8N 87.0E	KGWC
3	300900	12.0N	82.0E	PCN 5	T1.5/1.5	INIT OBS ULAC 12.8N 81.8E	KGWC
4	301435	12.2N	81.8E	PCN 6			KGWC
5	302144	13.6N	82.1E	PCN 6		ULAC FIX	KGWC
6	302145	13.0N	82.0E	PCN 6			FJDG
7	010300	14.6N	82.4E	PCN 5	T2.0/2.0	INIT OBS ULCC FIX	PGTW
8	010840	15.1N	82.6E	PCN 5	T3.0/3.0 /D1.5/24HRS	ULAC FIX	KGWC
9	010840	15.6N	82.9E	PCN 6			FJDG
* 10	011200	15.1N	81.7E	PCN 5			PGTW
11	011412	15.3N	83.1E	PCN 6		ULAC FIX	KGWC
* 12	011800	15.9N	82.0E	PCN 5			PGTW
13	012132	15.7N	83.0E	PCN 6		ULAC FIX	KGWC
14	020250	16.0N	84.5E	PCN 5			KGWC
15	020300	16.5N	83.2E	PCN 5	T3.0/3.0 /D1.0/24HRS		PGTW
16	020836	16.3N	84.6E	PCN 5	T4.5/4.5 /D1.5/24HRS		KGWC

17	021200	16.6N	84.2E	PCN 5			PGTW
18	021340	16.7N	85.0E	PCN 4		EYE DIA 6NM	KGWC
19	021340	17.3N	84.5E	PCN 6			FJDG
20	021600	16.6N	84.8E	PCN 1			PGTW
21	021800	16.7N	85.1E	PCN 1			PGTW
22	022120	17.0N	86.0E	PCN 2		EYE DIA 6NM	KGWC
23	030227	17.1N	86.9E	PCN 1		EYE DIA 16NM	KGWC
24	030300	17.2N	86.4E	PCN 1	T4.5/4.5 /D1.5/24HRS		PGTW
25	030600	17.4N	87.0E	PCN 1			PGTW
26	030823	17.4N	87.7E	PCN 1	T6.0/6.0 /D1.5/24HRS	EYE DIA 16NM	KGWC
27	031200	17.4N	88.4E	PCN 1			PGTW
28	031324	17.6N	88.7E	PCN 2		EYE DIA 10NM	KGWC
29	031600	17.4N	89.2E	PCN 1			PGTW
30	031800	17.4N	89.6E	PCN 1			PGTW
31	032100	17.4N	90.3E	PCN 1			PGTW
32	032100	17.4N	90.2E	PCN 1		EYE DIA 10NM	KGWC
33	040203	17.3N	91.9E	PCN 1		EYE DIA 9NM	KGWC
34	040300	17.5N	91.7E	PCN 1	T5.5/5.5-/D1.0/24HRS		PGTW
35	040600	17.5N	92.5E	PCN 1			PGTW
36	040811	17.3N	93.5E	PCN 1	T5.5/6.0-/W0.5/24HRS	EYE DIA 12NM	KGWC
37	040900	17.6N	93.4E	PCN 1			PGTW
38	041200	17.6N	94.1E	PCN 1			PGTW
39	041600	17.6N	94.8E	PCN 3			PGTW
40	041800	17.5N	95.4E	PCN 3			PGTW
41	042056	17.6N	96.6E	PCN 6			KGWC
42	042100	17.5N	96.4E	PCN 5		ULCC FIX	PGTW
43	050000	17.5N	96.0E	PCN 5			PGTW
44	050300	17.7N	97.0E	PCN 5	T3.0/4.0 /W2.5/24HRS		PGTW
* 45	050759	17.7N	99.2E	PCN 5	T3.0/4.0 /W2.5/24HRS		KGWC
* 46	250010	4.0N	85.2E	PCN 5	T0.5/1.0 /W0.5/24HRS		KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 22-82
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
080120Z	16.9	89.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080202Z	17.3	89.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	9.
080208Z	17.7	89.1	30	18.2	88.9	30.	32.	0.	19.6	88.3	40.	40.	-15.	21.0	88.2	40.	238.	10.	0.0	0.0	0.	-0.	0.
080214Z	18.0	89.7	35	18.5	88.8	35.	31.	0.	19.0	88.2	40.	88.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-3.	0.
080220Z	18.3	88.2	40	18.6	88.5	40.	25.	0.	19.5	87.9	45.	118.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080302Z	18.8	87.9	45	19.0	87.9	45.	12.	0.	20.8	86.0	45.	123.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080308Z	19.6	87.6	55	19.7	87.2	45.	23.	-10.	22.2	86.8	40.	134.	10.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
080314Z	20.2	86.7	55	20.2	87.1	45.	23.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080320Z	21.2	86.0	45	21.0	86.2	45.	16.	0.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
080402Z	22.2	85.2	40	22.3	85.5	40.	18.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080408Z	23.3	84.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	22.	106.	238.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	16.	36.	85.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	9.	10.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-3.	-3.	10.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	8	5	1	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 482. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 8. KNOTS

TC22-82
FIX POSITIONS FOR CYCLONE NO. 22

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	300600	13.5N	87.8E	PCN 5	T1.5/1.5	INIT OBS	PGTW
2	310600	14.9N	90.6E	PCN 5	T2.0/2.0 /D0.5/24HRS		PGTW
3	310752	15.2N	91.1E	PCN 5	T1.0/1.0	INIT OBS ULAC FIX	KGWC
4	311600	15.9N	89.7E	PCN 5		ULCC FIX	PGTW
5	312037	15.7N	89.3E	PCN 6		ULAC FIX	KGWC
6	010600	16.5N	92.3E	PCN 3	T1.5/2.0 /W0.5/24HRS		PGTW
7	011200	17.8N	92.6E	PCN 5			PGTW
8	011600	17.0N	88.9E	PCN 5		ULCC FIX	PGTW
9	012025	16.8N	89.4E	PCN 6		BASED ON EXTRAP	KGWC
10	012100	17.4N	89.9E	PCN 5		LLCC 16.8N 93.3E	PGTW
11	020000	17.8N	89.6E	PCN 5		ULCC FIX	PGTW
12	020225	16.8N	89.5E	PCN 5	T2.0/2.0 /D1.0/30HRS	ULAC FIX	KGWC
13	020600	17.9N	88.8E	PCN 5	T2.0/2.0 /D0.5/24HRS		PGTW
14	020910	18.0N	89.2E	PCN 5	T2.5/2.5 /D0.5/06HRS		KGWC
15	021600	17.9N	88.4E	PCN 5			PGTW
16	021800	18.3N	88.2E	PCN 5			PGTW
17	022100	18.6N	87.7E	PCN 5			PGTW
18	022155	18.6N	88.0E	PCN 6		ULAC FIX	KGWC
19	030000	19.0N	87.8E	PCN 5			PGTW
20	030300	19.4N	87.7E	PCN 5			PGTW
21	030600	19.6N	87.5E	PCN 5	T2.0/2.0-/S0.0/24HRS		PGTW
22	030858	19.9N	87.5E	PCN 3	T3.5/3.5 /D1.0/24HRS	EYE DIA 15NM	KGWC
23	030900	19.7N	86.9E	PCN 5			PGTW
24	031200	20.1N	87.0E	PCN 5			PGTW
25	031600	20.5N	86.7E	PCN 5			PGTW
26	031800	21.0N	86.5E	PCN 5			PGTW
27	032100	21.5N	85.9E	PCN 5			PGTW
28	032143	21.2N	85.8E	PCN 6			KGWC
29	040000	21.9N	85.5E	PCN 6		ULCC FIX	PGTW
30	040300	23.2N	85.7E	PCN 6	T1.5/2.0 /W0.5/21HRS		PGTW
31	040846	23.4N	84.5E	PCN 5	T1.0/2.0-/W2.5/24HRS		KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 23-82
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101320Z	13.2	91.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101402Z	13.8	90.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101408Z	14.2	89.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101414Z	14.8	88.2	30	14.2	89.6	30.	89.	0.	15.2	87.3	40.	174.	-5.	16.7	84.9	45.	201.	10.	0.0	0.0	0.	-0.	0.
101420Z	14.9	87.1	35	15.3	87.0	30.	25.	5.	16.5	84.8	[illegible]	89	-10.	[illegible]	[illegible]	45.	100	20	0.0	0.0	0	-0.	0.
101502Z	14.9	86.2	40	15.2	86.6	30.	29.	-10.	16.6	84.5	40.	101.	-10.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
101508Z	14.9	85.4	40	14.9	85.7	40.	17.	0.	16.2	83.1	50.	59.	5.	0.0	0.0	0.	-0.	0	0.0	0.0	0.	0.	0.
101514Z	15.2	84.3	45	15.0	84.5	45.	17.	0.	16.2	81.3	50.	36.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101520Z	15.7	83.5	50	15.2	83.1	45.	38.	-5.	17.3	79.6	25.	69.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
101602Z	16.2	82.8	50	15.9	82.4	50.	29.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101608Z	16.4	82.1	45	16.5	81.5	50.	35.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101614Z	16.8	81.4	35	17.2	81.7	35.	30.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
101620Z	17.2	80.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72 HR
AVG FORECAST POSIT ERROR	34.	88.	151.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	18.	49.	86.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	8.	15.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	-1.	15.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	9	6	2	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 681. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TC23-82
FIX POSITIONS FOR CYCLONE NO. 23

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
1	120802	11.8N	94.2E	PCN 5	T1.5/1.5	INIT OBS	KGWC
2	122047	13.0N	92.7E	PCN 6			KGWC
3	130300	11.9N	93.0E	PCN 4	T1.0/1.0	INIT OBS	PGTW
4	130600	12.2N	92.5E	PCN 6		ULCC FIX	PGTW
5	130750	14.0N	91.7E	PCN 5	T2.0/2.0 /D0.5/24HRS		KGWC
6	132033	13.6N	91.4E	PCN 6			KGWC
7	140000	14.1N	91.1E	PCN 6		ULAC FIX	PGTW
8	140300	14.1N	90.8E	PCN 4	T2.0/2.0-/D1.0/24HRS	ULAC 13.8N 89.2E	PGTW
9	140600	14.0N	90.6E	PCN 4		ULAC 13.7N 88.6E	PGTW
10	140900	14.8N	90.7E	PCN 6			PGTW
11	140920	13.4N	88.6E	PCN 5	T2.5/2.5 /D0.5/25HRS		KGWC
* 12	141200	15.5N	87.0E	PCN 6			PGTW
13	141600	15.2N	87.2E	PCN 6			PGTW
14	141060	15.3N	87.8E	PCN 6			PGTW
15	142100	15.3N	86.5E	PCN 6		ULCC FIX	PGTW
16	142205	14.7N	86.6E	PCN 6		ULAC FIX	KGWC
17	150000	15.4N	86.1E	PCN 6		ULAC FIX	PGTW
18	150300	14.7N	86.2E	PCN 6	T3.0/3.0 /D1.0/24HRS		PGTW
19	150600	14.8N	85.8E	PCN 6			PGTW
20	150900	14.8N	85.2E	PCN 6		ULAC FIX	PGTW
21	150900	14.7N	85.1E	PCN 5	T1.5/2.5 /W1.0/24HRS		KGWC
22	151200	15.1N	84.6E	PCN 6		ULCC FIX	PGTW
23	151600	15.2N	83.5E	PCN 6			PGTW
24	151800	15.2N	83.1E	PCN 6			PGTW
25	152100	15.3N	82.6E	PCN 6			PGTW
26	152152	16.0N	83.6E	PCN 5			KGWC
27	160000	15.9N	82.5E	PCN 6			PGTW
28	160600	16.3N	82.2E	PCN 6	T3.0/3.0-/S0.0/27HRS		PGTW
29	160856	17.0N	82.7E	PCN 5	T1.5/1.5-/S0.0/24HRS	ULCC FIX	KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 24-82
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
101700Z	10.4	83.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101714Z	11.0	83.0	35	10.9	83.6	30.	36.	-5.	13.4	81.2	45.	58.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101720Z	11.6	82.2	40	11.0	82.4	40.	17.	0.	14.2	80.4	50.	58.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101802Z	12.1	81.6	45	12.1	82.2	45.	35.	0.	14.2	80.4	50.	88.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101808Z	12.9	81.1	45	12.8	81.7	50.	36.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101814Z	13.8	80.3	50	13.8	80.2	50.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101820Z	14.6	79.5	45	14.5	79.6	45.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.	0.0	0.0	0.	-0.	0.
101902Z	15.1	79.2	30	14.9	79.4	30.	17.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	22.	68.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	15.	22.	0.	0.	0.	3.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	1.	10.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	0.	7.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	7	3	0	0	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 389. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TC24-82
FIX POSITIONS FOR CYCLONE NO. 24

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
* 1	150900	7.6N	88.0E	PCN 5	T1.5/1.5	INIT OBS ULCC FIX	KGWC
* 2	160856	9.2N	83.8E	PCN 5	T2.0/2.0 /D0.5/24HRS	ULCC FIX	KGWC
* 3	162140	10.9N	84.2E	PCN 6		ULCC 10.8N 81.4E	KGWC
4	170843	10.5N	83.5E	PCN 5	T2.5/2.5 /D0.5/24HRS		KGWC
5	172120	11.0N	81.3E	PCN 6		ULCC FIX	KGWC
6	180831	12.9N	80.1E	PCN 5	T3.0/3.0-/D0.5/24HRS		KGWC

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION		INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	181500	14.0N	80.0E	045	030	WMO43279

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 25-82
BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
110414Z	11.1	63.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110420Z	11.3	63.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110502Z	11.8	63.5	30	11.0	62.7	35.	67.	5.	12.6	59.9	40.	294.	5.	13.7	56.9	50.	503.	-5.	15.7	54.2	55.	919.	-25.
110508Z	12.1	63.8	30	11.5	62.8	30.	69.	0.	12.3	60.0	40.	273.	0.	13.2	58.0	50.	582.	-10.	14.8	55.1	55.	944.	-35.
110514Z	12.4	64.2	30	12.5	63.2	30.	59.	0.	14.1	61.4	40.	251.	-5.	15.2	59.2	45.	539.	-20.	16.3	56.9	35.	887.	-45.
110520Z	12.7	64.5	30	12.0	63.0	30.	97.	0.	13.0	62.7	35.	223.	-15.	14.7	60.8	40.	513.	-30.	15.8	58.6	35.	884.	25.
110602Z	13.1	64.9	35	14.2	62.8	35.	139.	0.	16.4	60.5	45.	370.	-10.	18.1	58.0	50.	675.	-50.	19.2	56.0	35.	1022.	-5.
110608Z	13.5	65.3	40	14.0	62.2	35.	103.	-5.	15.7	59.6	45.	457.	-15.	17.5	57.2	50.	775.	-40.	0.0	0.0	0.	-0.	0.
110614Z	13.9	65.7	45	13.8	65.8	45.	8.	0.	15.8	67.6	55.	99.	-10.	18.7	69.1	60.	220.	-20.	0.0	0.0	0.	-0.	0.
110620Z	14.5	66.2	50	14.3	66.2	50.	12.	0.	16.7	68.0	55.	109.	-15.	19.6	69.5	65.	230.	5.	0.0	0.0	0.	-0.	0.
110702Z	15.3	66.8	55	14.9	66.6	60.	27.	5.	17.2	68.2	75.	160.	-5.	20.4	69.0	60.	261.	20.	0.0	0.0	0.	-0.	0.
110708Z	16.3	67.5	60	15.4	67.0	60.	61.	0.	17.8	68.8	75.	108.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110714Z	17.3	68.3	65	17.1	68.1	65.	17.	0.	21.1	71.0	60.	41.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110720Z	18.3	68.9	70	18.0	68.8	65.	19.	-5.	22.1	71.6	55.	57.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110802Z	19.4	69.8	80	19.1	69.1	65.	44.	-15.	23.0	71.4	45.	142.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110808Z	20.5	70.5	90	20.0	69.3	60.	74.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110814Z	21.6	71.5	80	21.3	71.2	80.	25.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110820Z	22.3	72.6	60	22.2	72.1	65.	28.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110902Z	22.5	73.9	40	22.4	73.7	40.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48 HR	72-HR
AVG FORECAST POSIT ERROR	55.	205.	487.	931.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	34.	113.	264.	519.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	4.	10.	20.	27.	0.	0.	0.	0.
AVG INTENSITY BIAS	-2.	-8.	-14.	-27.	0.	0.	0.	0.
NUMBER OF FORECASTS	17	13	9	5	0	0	0	0

DISTANCE TRAVELED BY TROPICAL CYCLONE IS 949. NM

AVERAGE SPEED OF TROPICAL CYCLONE IS 9. KNOTS

TC25-82
FIX POSITIONS FOR CYCLONE NO. 25

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	COMMENTS	SITE
*	1	032307	12.5N	66.1E	PCN 5		ULAC 11.5N 66.4E	KGWC
*	2	041010	12.3N	62.4E	PCN 5	T2.5/2.5+/D1.5/24HRS	ULAC 12.5N 61.6E	KGWC
*	3	042255	10.6N	62.3E	PCN 5		ULAC 11.4N 62.6E	KGWC
	4	050958	12.1N	63.3E	PCN 5	T3.0/3.0 /D0.5/24HRS	ULAC 12.9N 62.6E	KGWC
*	5	052243	14.0N	63.2E	PCN 5		ULAC 12.3N 63.0E	KGWC
	6	060946	13.3N	65.7E	PCN 5	T3.0/3.0 /S0.0/24HRS	ULAC 12.5N 64.4E	KGWC
	7	062231	14.5N	66.3E	PCN 5			KGWC
	8	070934	16.4N	67.7E	PCN 5	T3.5/3.5 /D0.5/24HRS	ULAC 16.0N 70.5E	KGWC
	9	072218	18.5N	68.9E	PCN 5		ULAC 18.5N 69.3E	KGWC
	10	080921	20.6N	70.6E	PCN 1		EYE DIA 24NM	KGWC

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION		INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	041200	11.0N	64.2E	020	010	SHIP OBSERVATION
2	060600	14.0N	62.2E	040	090	SHIP OBSERVATION
3	081500	21.0N	71.7E	060	060	WMO 42737
4	090000	22.3N	73.3E	040	060	WMO 42647

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

APPENDIX I
CONTRACTIONS

ACCRY	Accuracy
ACFT	Aircraft
ADP	Automated Data Processing
AFGWC	Air Force Global Weather Central
AIREP	Aircraft Weather Report(s) (Commerical and Military)
ANT	Antenna
AOR	Area of Responsibility
APRNT	Apparent
APT	Automatic Picture Transmission
ARWO	Aerial Reconnaissance Weather Officer
ATT	Attenuation
AVG	Average
AWN	Automated Weather Network
BPAC	Blended Persistence and Climatology
BRG	Bearing
CDO	Central Dense Overcast
CI	Cirriform Cloud or Cirrus also Current Intensity (Dvorak)
CINCPAC	Commander-in-Chief Pacific AF - Air Force, FLT - Fleet (Navy)
CLD	Cloud
CLIM	Climatology
CLSD	Closed
CM	Centimeter
CNTR	Center
CPA	Closest Point of Approach
CSC	Cloud System Center
CYCLOPS	Tropical Cyclone Steering Program (HATTRACK and MOHATT)
DEG	Degree(s)
DIAM	Diameter
DIR	Direction
DMSP	Defense Meteorological Satellite Program
EL	Elongated
ELEV	Elevation
EXP	Exposed
FI	Forecast Intensity (Dvorak)
FLT	Flight
FNOC	Fleet Numerical Oceanography Center
FT	Feet (Foot)
GMT	Greenwich Mean Time
GOES	Geostationary Operational Environmental Satellite
HATTRACK	Hurricane and Typhoon Tracking (Steering) Program
HGT	Height
HPAC	Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)
HR	Hour(s)
HVY	Heavy
ICAO	International Civil Aviation Organization
INIT	Initial
INJAH	North Indian Ocean Component of TYAN
INST	Instruction
IR	Infrared
KM	Kilometer(s)
KM/HR	Kilometer(s) per Hour
KT	Knot(s)
LLCC	Low-level Circulation Center
LVL	Level
M	Meter(s)
M/SEC	Meter(s) per Second
MAX	Maximum
MB	Millibar(s)
MET	Meteorological
MIN	Minimum
MOHATT	Modified HATTRACK
MOVG	Moving
MSLP	Minimum Sea Level Pressure
MSN	Mission
NAV	Navigational
NEDN	Naval Environmental Data Network
NEDS	Naval Environmental Display Station
NEPRF	Naval Environmental Prediction Research Facility
NESS	National Environmental Satellite Service
NET	Near Equatorial Trough
NM	Nautical Mile(s)
N/O	Not Observed
NOAA	National Oceanic and Atmospheric Administration
NOCC	Naval Oceanography Command Center
NWOC	Naval Western Oceanography Center

NR	Number
NRL	Naval Research Laboratory
NTCM	Nested Tropical Cyclone Model
OBS	Observation(s)
OTCM	One-way (Interactive) Tropical Cyclone Model
PACOM	Pacific Command
PCN	Position Code Number
PSBL	Possible
PTLY	Partly
QUAD	Quadrant
RADOB	Radar Observation(s)
RECON	Reconnaissance
RNG	Range
RT	Right
SAT	Satellite
SFC	Surface
SLP	Sea Level Pressure
SPOL	Spiral Overlay
SRP	Selective Reconnaissance Program
STNRY	Stationary
SST	Sea Surface Temperature
ST	Subtropical
STR	Subtropical Ridge
STY	Super Typhoon
TAPT	Typhoon Acceleration Prediction Technique
TC	Tropical Cyclone
TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
TCFA	Tropical Cyclone Formation Alert
TCM	Tropical Cyclone Model
TD	Tropical Depression
TDO	Typhoon Duty Officer
TIROS	Televison Infrared Observation Satellite
TS	Tropical Storm
TY	Typhoon
TYAN	Typhoon Analog Program
TYFN	Western North Pacific Component (Revised) of TYAN
TUTT	Tropical Upper-Tropospheric Trough
ULAC	Upper-level Anticyclone
VEL	Velocity
VIS	Visual
VSBL	Visible
WESTPAC	Western (North) Pacific
WMO	World Meteorological Organization
WND	Wind
WRNG(S)	Warnings
WRS	Weather Reconnaissance Squadron
XTRP	Extrapolation
Z	Zulu Time (Greenwich Mean Time)

APPENDIX II

DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement.

CENTER - The vertical axis or core of a tropical cyclone. Usually determined by wind, temperature, and/or pressure distribution.

CYCLONE - A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the Northern Hemisphere).

EPHEMERIS - Position of a body (satellite) on space as a function of time; used for gridding satellite imagery. Since ephemeris gridding is based soley on the predicted position of the satellite, it is susceptible to errors from vehicle pitch, orbital eccentricity, and the oblateness of the earth.

EXPLOSIVE DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 2.5 mb/hr for 12 hrs or 5.0 mb/hr for six hrs (ATR 1971).

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy sources from release of latent heat of condensation to baroclinic processes. The term carries no implications as to strength or size.

EYE - "EYE" is used to describe the central area of a tropical cyclone when it is more than half surrounded by wall cloud.

FUJIWHARA EFFECT - An interaction in which tropical cyclones within about 700 nm (1296 km) of each other begin to rotate about one another. When intense tropical cyclones are within about 400 nm (741 km) of each other, they may also begin to move closer to each other.

MAXIMUM SUSTAINED WIND - Maximum surface wind speed averaged over a one-minute period of time. Peak gusts over water average 20 to 25 percent higher than sustained winds.

RAPID DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 1.25 mb/hr for 24 hrs (ATR 1971).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west or northwest to a path toward the northeast.

RIGHT ANGLE ERROR - The distance described by a perpendicular line from the best track to a forecast position. (See Figure 4-1).

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUPER TYPHOON/HURRICANE - A typhoon/hurricane in which the maximum sustained surface wind (one-minute mean) is 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind (one-minute mean) is 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection--generally 100 to 300 nm (185 to 556 km) in diameter--originating in the tropics or subtropics, having a non-frontal migratory character, and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical depression, tropical storm or typhoon (hurricane).

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds (one-minute mean) in the range of 34 to 63 kt (17 to 32 m/sec) inclusive.

TROPICAL UPPER-TROPOSPHERIC TROUGH (TUTT) - "A dominant climatological system, and a daily synoptic feature, of the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans," from - Sadler, J.C., Feb. 1976: Tropical Cyclone Initiation by the Tropical Upper-Tropospheric Trough (NAVENVPREDRSCHFAC Technical Paper No. 2-76).

TYPHOON/HURRICANE - A tropical cyclone in which the maximum sustained surface wind (one-minute mean) is 64 kt (33 m/sec) or greater. West of 180 degrees longitude they are called typhoons and east of 180 degrees they are called hurricanes. Foreign governments use these or other terms for tropical cyclones and may apply different intensity criteria.

VECTOR ERROR - The distance described by a straight line from the forecast position to the position at verification time as found on the best track. (See Figure 4-1).

WALL CLOUD - A organized band of cumuliform clouds immediately surrounding the central area of a tropical cyclone. The wall cloud may entirely enclose or only partially surround the center.

APPENDIX III
NAMES FOR TROPICAL CYCLONES

Column 1	Column 2	Column 3	Column 4
ANDY	ABBY	ALEX	AGNES
BESS	BEN	BETTY	BILL
CECIL	CARMEN	CARY	CLARA
DOT	DOM	DINAH	DOYLE
ELLIS	ELLEN	ED	ELSIE
FAYE	FORREST	FREDA	FABIAN
GORDON	GEORGIA	GERALD	GAY
HOPE	HERBERT	HOLLY	HAZEN
IRVING	IDA	IKE	IRMA
JUDY	JOE	JUNE	JEFF
KEN	KIM	KELLY	KIT
LOLA	LEX	LYNN	LEE
MAC	MARGE	MAURY	MAMIE
NANCY	NORRIS	NINA	NELSON
OWEN	ORCHID	OGDEN	ODESSA
PAMELA	PERCY	PHYLLIS	PAT
ROGER	RUTH	ROY	RUBY
SARAH	SPERRY	SUSAN	SKIP
TIP	THELMA	THAD	TESS
VERA	VERNON	VANESSA	VAL
WAYNE	WYNNE	WARREN	WINONA

NOTE:

Names are assigned in rotation, alphabetically. When last name (WINONA) has been used, the sequence will begin again with "ANDY."

Source: CINCPACINST 3140.1 (series)

APPENDIX IV

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APPENDIX V

PAST ANNUAL TYPHOON/TROPICAL CYCLONE REPORTS

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